THE RHODESIA

Agricultural Journal.

Issued by Authority of
the Minister of Agriculture and Lands.

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Leading Features.

PUBLISHED MONTHLY.

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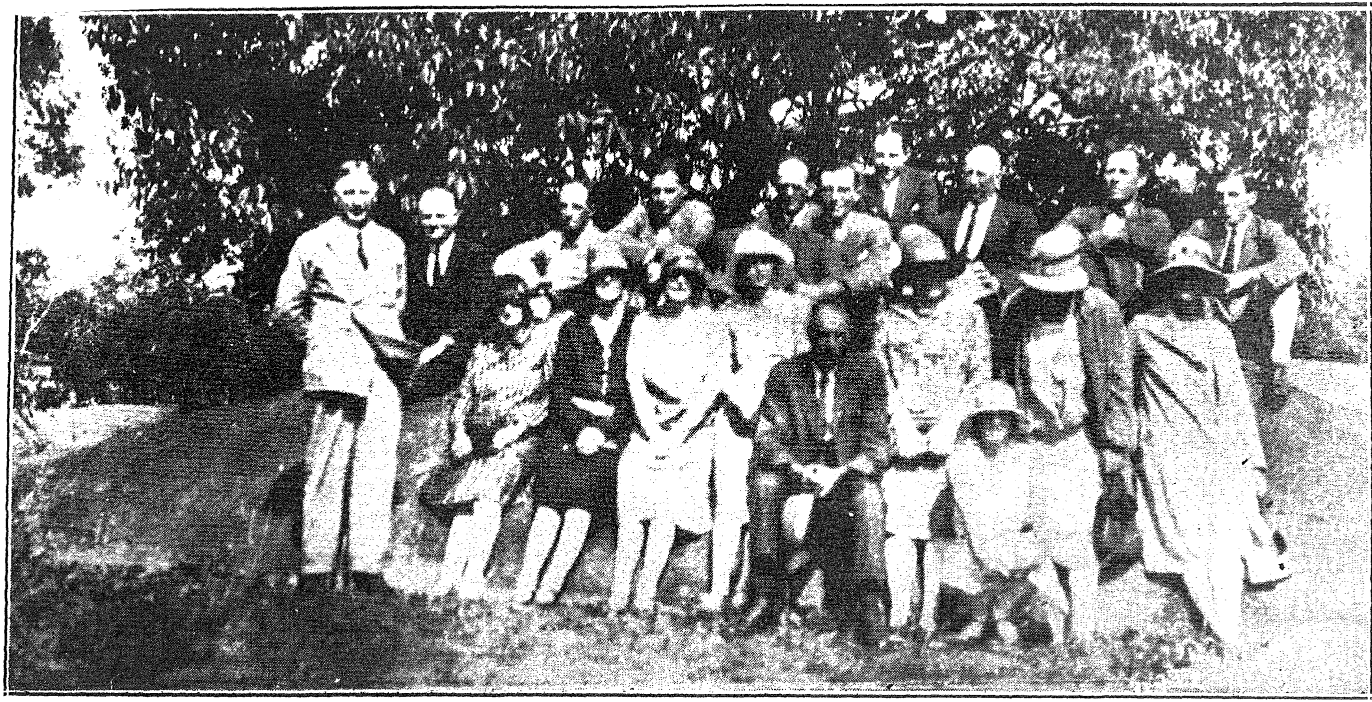

Monthly meeting at Imbgu Farm (Mr. J. Symmonds). Salisbury (South) Farmers' Association.

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Editor - - *William E. Meade.*

VOL. XXVII] JANUARY, 1930. [No. 1

Editorial.

Contributions and correspondence regarding subjects affecting the farming industry of Southern Rhodesia are invited. All communications regarding these matters and advertisements should be addressed to:—The Editor, Department of Agriculture, Salisbury.

Wishing all our Farmers A Good Season and a Prosperous New Year.

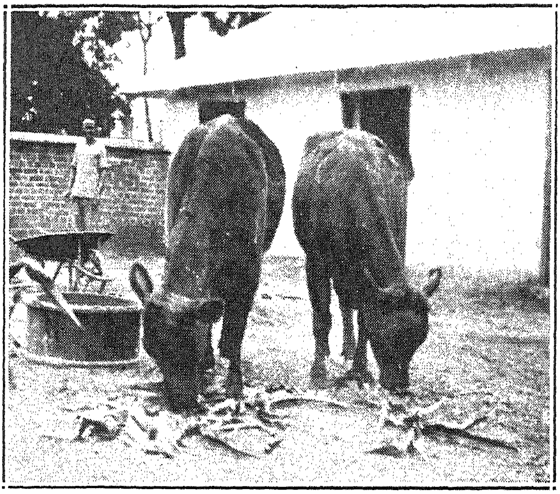
Salisbury (South) Farmers' Association.—This is a live association; its members take a keen and intelligent interest in matters that concern the well-being of the farming industry, and it is a staunch supporter of the Rhodesia Agricultural Union. It has aspirations of a farmers' hall and is quietly and hopefully accumulating funds with this object. Pending the erection of such an institution, the monthly meetings are held at various parts of the district and frequently at the picturesque spot shown in the illustration on the opposite page. The area covered by the Salisbury (South)

Farmers' Association is an extensive one and takes in the Hunyani River and beyond it to a point approximately 25 miles south of Salisbury. It is almost entirely a typical sand veld area.

The district has been freely settled in the last few years, the principal attraction being tobacco, of which some excellent crops have been grown. Unfortunately the slump in this commodity has hit the Salisbury South farmers—in common with many other farmers in the Colony—very hard, and practically on every farm are to be seen barns lying idle or barns being used to a small proportion of their capacity. Farmers have therefore to seek other outlets as sources of revenue, and maize, cotton, ground nuts, sunflowers, dairying, pig raising and poultry have been added to the farm economy.

In a short survey of the farms in the district we saw evidences of progressive and diversified farming that will, no doubt, bring its reward. On one farm we were informed that 551 bags of maize were reaped last season from 53 acres. This result was obtained by a system of rotation, assisted by economic fertiliser treatment. At the farm Zengea, of which Mr. D. Boyd is in charge, there were at the time of our visit (27th November) 125 acres of maize, all check-row planted, showing above ground and giving promise of a good yield. A successful crop of cotton was grown on this farm last season and a further area of 60 acres had already been planted this season and was looking well. Turkish tobacco was to be planted in January. Mr. G. N. Fleming, who is president of the association, owns land in the vicinity of the Hunyani River, and although his principal activity is directed towards breeding cattle, which he is grading up with the use of Sussex and Red Poll bulls, he is following the cult of "mixed farming" on lines advocated by the Department of Agriculture. It was indeed pleasing to see the hygienic and comfortable manner in which his pigs were housed, and the general well-being of the young baconers showed full appreciation of the attention given.

The farmers of Salisbury South are experiencing heavy weather and some are "up against it." Notwithstanding this, all difficulties are being met courageously and cheerfully, and we feel sure that in spite of the setback caused by the tem-



Imported Red Poll heifers at Mr. G. N. Fleming's farm, Gilston, Salisbury South.

Homestead at Zengea Farm (Mr. D. Boyd), Salisbury South.

porary effacement of tobacco, the farmers of this district will win through and will take their share in the upbuilding of this young Colony.

World Agricultural Tractor Trials.—Under the auspices of the Royal Agricultural Society of England, in conjunction with the Institute of Agricultural Engineering, University of Oxford, agricultural tractor trials are to be held in 1930. The trials, which will be open to machines manufactured in any country of the world, with no restriction as to weight or horse power, but limited to two machines of any one make or model, will consist of two parts: (a) tests of a scientific and practical nature not open to the public, and (b) a public demonstration.

They will be carried out under the supervision of the Institute of Agricultural Engineering on land near Oxford. The dates proposed for the actual field operations are from 1st June to 1st September, 1930; the public demonstration will take place on 16th to 19th September, when entrants will be required to put their machines through their paces. The result of the trials will subsequently be published by the Institute in the form of a report.

The Utilisation of Rhodesian Timbers.—We publish in this issue of the Journal the second of a series of articles which the Assistant Forest Officer is writing regarding the treatment and utilisation of Rhodesian timbers. It will be remembered that Mr. Wilkinson recently visited Pretoria, where, owing to the courtesy of the Minister of Agriculture in the Union, he was able to make a study of the methods in vogue for the seasoning and preservation of locally grown timbers for commercial purposes. The first article, which appeared in the November issue of the Journal, dealt with the process of seasoning, while the second, which appears in the present issue, has to do with preservation of timbers. As is well known, the limiting factor in the utilisation of Rhodesian timbers has been lack of knowledge as to the correct methods of treating these timbers so as to render them

durable and impervious to such faults as splitting and warping, as well as insect and fungus attacks. These articles are written with the object of making it possible to use in a larger measure Rhodesian-grown timbers in preference to imported ones, which it was shown in a recent issue of the Journal cost us in a round sum £381,000 per annum. In passing it might be mentioned that already a small industry has sprung up in the Colony, where properly seasoned wagon material and pick handles in limited quantities are being produced. These have been subjected to practical tests with satisfactory results.

The two articles which have now appeared cover the general methods which are advocated by the Forestry Department for the treatment of timbers for commercial purposes. Other articles will appear later which will deal more particularly with the treatment of timber for farm purposes by methods which can easily be applied by the average farmer. Persons interested and having stocks of indigenous wood should get into touch with the Forest Service officers.

Road Motor Services.—Bulletin No. 35, issued in December by the Rhodesia Railways, contains some interesting figures relative to the operation of the road motor services for September. It is noted that at present the service as a whole is being run at a loss, which is perhaps only to be expected in the early days of such a system. The railway administration, however, designed the service with the definite object of encouraging the development of agriculture in areas which have previously been held back by lack of transport facilities, and from what we can gather this is being achieved. Road motor services are of especial benefit in a Colony such as this, where the railway system consists mainly of trunk lines, and we trust that as circumstances warrant, similar transport facilities will be extended to other parts of the Colony.

The traffic conveyed during September totalled 6,380 tons, which is some 600 tons more than that carried during the previous month. Cream traffic dropped, however, from 1,069 gallons in August to 990 gallons in September. This drop in cream traffic is, of course, to be expected towards

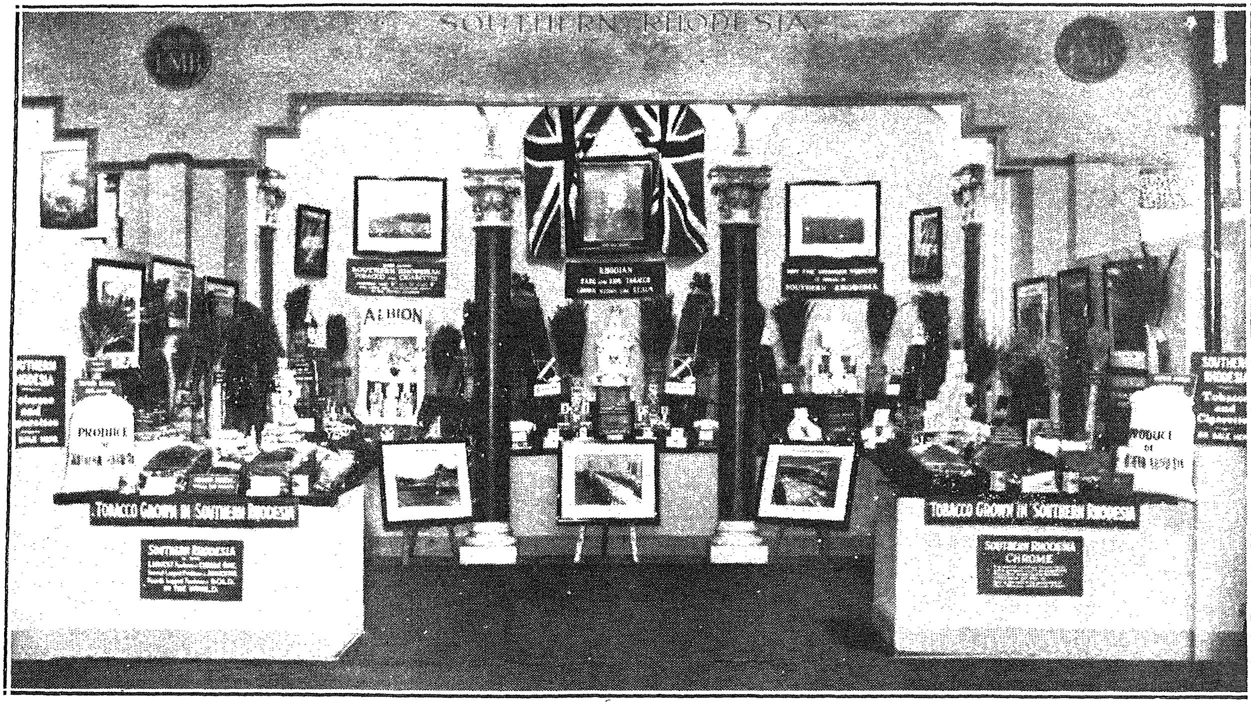
the close of the dry season. Maize was the principal commodity carried during September, and all vehicles were fully employed in meeting demands for transport. The Glendale, Concession and Umgusa Valley services were especially busy in the transport of maize. The number of passengers carried by road motor services increased from 1,442 in August to 1,506 in September. It is of interest to note that consideration is being given to the provision of more comfortable accommodation for passengers on road motor vehicles. The mileage run in September was 48,104, this being a slight increase over the August figure of 47,121 miles. Trailers were employed for 21,091 miles, and this gives an indication of the extent to which these vehicles are being used.

The total number of vehicles now in use or being assembled comprises 47 lorries and 26 trailers. Of these, 13 are 5-ton lorries and 15 are 5-ton trailers. With the exception of six, the entire fleet of lorries is composed of six-wheelers. Two additional lorries are on order, as well as four additional trailers.

The Beef Cattle Situation in the United States.—The Live Stock Review for 1928, issued by the United States Department of Agriculture, gives a great deal of useful information relative to the beef trade of that country. It is stated that the cattle situation during 1928 was generally good, being especially favourable to the cattle grower. Prices held the relatively high level reached in late 1927, with about normal seasonal variations. These averaged the highest since 1919, and from the standpoint of purchasing power they apparently were the highest on record. The average cost of all cattle for slaughter during the year was 10.59 dollars per 100 lbs. as compared with 8.63 dollars for 1927 and 7.32 dollars for 1926. Federally inspected slaughter of cattle during 1928 totalled 8,467,308 head, which was 1,052,796 head or 11 per cent. less than the slaughter in 1927 and 17 per cent. less than the heavy slaughter in 1926. Barring 1921, when cattle were held off the market as the result of low prices and depressed financial conditions, slaughter in

1928 was the smallest since 1916. The estimated total per capita consumption of beef for the year was 51.7 pounds as compared with 58.4 pounds in 1927, 63.6 pounds in 1926 and 56 pounds in 1916. Imports of beef (fresh, cured and canned, including some veal) amounted to approximately 122,000,000 pounds, as compared with 78,000,000 pounds in 1927. Imports of live cattle were practically all from Canada and Mexico, and amounted to 534,804 head as against 445,345 head in 1927. Canada's contribution totalled 284,000 for the year, as compared with 204,000 in 1927; of the 1928 total, however, a large proportion were dairy cattle going into the New England and Middle Atlantic States. Those from Mexico were almost entirely stocker cattle for re-stocking ranges in the south-west. These imports, therefore, contributed but little to the beef supply in 1928. Wholesale prices of choice heavy steer carcases at New York averaged 23.54 dollars per 100 lbs. for the year, as against 20.66 dollars for 1927. The weighted average retail price of beef computed from average prices reported by the United States Bureau of Labour Statistics for 52 cities, on cuts representing the equivalent of 63.5 per cent. of the beef carcase, was 32.4 cents for 1928, as compared with 28.1 cents for 1927 and 27 cents for 1926.

In summarising the general cattle situation it is stated that there is at present a close adjustment between cattle production and slaughter, and cattle production is at the low point of the cycle—a level which corresponds to that of 1912. The unfavourable price situation during the past several years caused liquidation of breeding and growing stock, with the result that slaughter exceeded production and numbers on farms and ranges were rapidly depleted. It is thought that the present level of cattle prices will encourage increased cattle production, but the warning is issued that when prices are approaching the peak of a cycle is not usually a good time for beginners to enter any industry. The total numbers of all cattle and calves on farms and ranges on 1st January, 1929, were 55,751,000, as compared with the revised estimate of 55,681,000 at the beginning of 1928, but the increase is regarded as negligible and more than accounted for by increased imports.



Southern Rhodesia stand at Hull Civic and Empire Exhibition, October, 1929.

The Hull Civic and Empire Exhibition.—As will be seen from the illustration on the opposite page, Southern Rhodesia was represented at the exhibition which was held at Hull from 10th to 12th October and from the 14th to 16th October. The opening ceremony was performed by H.R.H. Prince George in the presence of a large and representative gathering of citizens, and the exhibition during the six days it was in progress was visited by some 70,000 people. The exhibits of agricultural products at the Southern Rhodesia stand included maize, cotton, ground nuts, Soya beans, wheat, oats, barley and numerous other grains and seeds, as well as specimens of timbers. Mineral exhibits included gold quartz, asbestos, chrome ores, chromium products, mica, copper ore, coal, etc. A special feature was made of the exhibit of 250 lbs. of tobacco of various types, in the leaf as well as manufactured.

The report of the officer in charge of the Colony's exhibit states that the Southern Rhodesia exhibit attracted considerable attention and was considered by some to be the most comprehensive display in the exhibition. Rhodesian cigarettes and tobaccos to the value of £113 5s. 8d. were sold during the period of the exhibition, and the aid of retail tobacconists was enlisted to popularise our leaf. One firm, it is stated, has sold during five months, in addition to Rhodian cigarettes, 200,000 cigarettes manufactured entirely from Southern Rhodesian tobacco. The Southern Rhodesian representative passes on a suggestion from a manufacturer which is worthy of consideration by those concerned. It is to the effect that the bales of tobacco should bear an identification mark, so that when additional supplies of this particular leaf are required they can be procured. He writes: "This manufacturer expressed the opinion that an increased demand for our unmanufactured tobacco would be created if bales bore certain markings which identified the grower. He explained that his reason for expressing this opinion is due to the fact that about fifteen months ago his brokers supplied his firm with 30 bales of excellent tobacco of a bright Virginia type which was grown in Southern Rhodesia, and it was anticipated that some difficulty would be experienced in obtaining further supplies of a similar type of tobacco when these are required, on account of the absence of any marking by which the grower could be identified."

High Priced Grain Bags in South Africa.—Early in the year a special request was addressed to the Department of Agriculture of the Union of South Africa to investigate the causes of the relatively high post-war prices of grain bags. The investigation was undertaken by the Division of Agricultural Economics and Markets, and the findings are recorded in the form of a bulletin. Unfortunately it appears that the causes of these high prices are entirely beyond the control of South African importers and producers, and that the relatively small quantity of gunnybags imported cannot in any way influence prices. The bulletin, however, serves a useful purpose in acquainting farmers with the actual conditions in the grain bag market.

Grain bags are made from jute, practically all of which is produced in India, in the provinces of Bengal, Assam, Behar and Orissa, including Nepal. However, Bengal practically monopolises the production. The production of jute in India in 1928 amounted to 9,916,000 bales of 400 lbs. The value of the exports of gunnybags from India in 1926-27 was 243,772,000 rupees, of which South Africa was responsible for 10,407,000 rupees. Australia is by far the most important country with regard to the purchase of these bags from India, while South Africa imported only 4.2 per cent. of the total. Other countries, of which the largest importer is Germany and the next largest Great Britain, import the raw jute from India, although the U.S.A. and Argentine import very large quantities of gunnycloth with which to manufacture their own bags. In the east, Calcutta is the only place where bags are manufactured, and there are about 57 jute mills in operation.

The writer of the bulletin ascribes the high prices which South Africa has to pay for grain bags to two factors, i.e., change of economic conditions in India and in the rate of exchange on the Calcutta Gunny Exchange. After the war economic conditions have changed in India as in practically every other country. Labour has become more expensive and higher wages are being paid. The cost of living has increased, and apart from this the mills have often operated on short weeks, sometimes working only four days, although paying out full week's wages, thus not allowing the output to dominate the demand. In 1914 the rate of exchange was 1s. 4d.; it has been 1s. 6d. during the last few years.

With these two factors removed from the general annual wholesale price index for grain bags in South Africa, it is seen that the price for 2½-lb. grain bags in 1928 was in reality below that of 1914 and the lowest price obtained for the last five years. The writer has formed the opinion that South Africa, importing only a very small percentage of the total gunnybags output of Calcutta, cannot in any way affect the price of grain bags on that market. The best suggestion for South Africa would be to adopt, if possible, a policy of centralised or co-operative buying which would ensure supplies of grain bags at relatively reasonable prices when bought during the right time on this fluctuating market.

The Effect of Pasteurisation on the Nutritive Value of Milk.—This is a subject which has provoked a good deal of discussion and given rise to considerable diversity of opinion. Enquiries are frequently received by the Department of Agriculture on the point, and it may be of use if we summarise the findings of a committee of scientists set up in Great Britain to investigate the matter. These findings are recorded in the Scottish Journal of Agriculture for October, 1926, and a copy of the article has reached us in bulletin form through the courtesy of the Rowett Institute, Aberdeen.

It was found that heat reduced the amount of soluble calcium in milk. In fresh milk about 26 per cent. of the total calcium is in the diffusible or soluble form, in pasteurised milk about 20 per cent., and in milk which has been kept at boiling point for one hour, about 15 per cent. The losses in soluble calcium are believed to be due to the formation of a colloidal form of calcium phosphate. Souring of milk causes a rise in the soluble calcium to an extent depending on the degree of souring.

It is interesting to note here that the heating of milk interferes with the processes involved in cheese-making. This is most probably due to the reduction of soluble calcium, since for cheese-making the natural properties of fresh milk can be restored by adding a soluble calcium salt to the heated milk.

Feeding experiments were carried out to determine

whether any difference could be detected in the health and rate of growth of calves fed on pasteurised milk as compared with calves fed on fresh milk, and also whether the addition of a soluble calcium salt to pasteurised milk would affect its nutritive value. The calves were reared in the ordinary way, milk only being given for the first forty or fifty days, and then some form of concentrate and roughage added gradually. It was found that the average increase in weight was greater in the calves receiving fresh milk than in those receiving pasteurised milk. In all the tests the rate of growth was greater in the calves receiving the pasteurised milk plus the soluble calcium salt than in those receiving pasteurised milk only.

All the calves receiving either fresh milk or pasteurised milk plus the soluble calcium salt remained in perfect health. Those receiving pasteurised milk were not in such good condition as the others. They had not the same "bloom" of perfect health. In one experiment, in which the calves received pasteurised milk only, gross signs of malnutrition appeared.

The report emphasises the point that the number of experiments and the number of animals in the individual tests were too small to enable definite conclusions to be drawn. It is stated, however, that the results seem to indicate that the process of pasteurisation affects the physiological properties of milk in such a way as to decrease its value for promoting growth and maintaining health in young animals. At the same time, notwithstanding the rigorous conditions under which the experiments were carried out, fairly healthy calves were reared in two out of three of the tests with pasteurised milk.

On the important point as to whether pasteurisation reduces the value of milk for children, the committee have little direct conclusive evidence. In regard to this it is stated: "The only experimental results applicable to children would be experiments carried out on children themselves. . . . In the absence of such tests the results of the above and other similar investigations seem to warrant the opinion that while pasteurisation affects the nutritive value of milk, the evil effects can be prevented, and in any case are less

serious than the risk of infection with tubercle bacilli or other disease-causing bacteria liable to be present in ordinary fresh milk. The ideal milk, however, is undoubtedly fresh milk completely free from the danger of conveying infection."

Milk Consumption and the Growth of School Children.—Many of our readers will be conversant with the results of a preliminary investigation carried out in 1926-27 by the Scottish Board of Health to determine the effect of the addition of milk to the diet of school children. This report received wide publicity and created great interest, for the conclusions were of far-reaching importance. The investigation was continued during the period November, 1927, to June, 1928, and the results were published in the *Lancet* of January, 1929, a reprint of which has been received by us through the courtesy of the Rowett Institute, Aberdeen.

The investigation was carried out at seven centres, namely, Peterhead, Aberdeen, Dundee, Edinburgh, Glasgow, Greenock and Belfast. The number of children involved was 1,425. At each place four groups of children were selected and each group treated differently. One group received whole milk, another separated milk, a third a biscuit ration of the caloric value of the separated milk, while a fourth acted as controls, receiving nothing. The children of 13 to 14 years received one pint of milk daily, those of 9 to 10 the same, and those of 6 to 7 years three-quarters of a pint daily. It was found that there was an average increase in height of 23.5 per cent. and weight of 45.37 per cent. in favour of the milk-fed groups over the non-milk groups. These increases are greater than those in the first (1927) test. In every case the milk-fed children were ahead of the "biscuit" and "control" groups. The greatest increase in height was in the six-year-old milk-fed group. The greatest increase in weight was in the 13-year-old separated milk group. The difference between the "biscuit" group and the "controls" was but slight, except that the 13-year-old "controls" did better in height, but not so well in weight.

Dr. C. A. Douglas examined all the children clinically when they were measured. Her report states:—

"In practically every case it was noted that the children receiving milk showed, even where there was obviously poor maternal care, that sleekness peculiar to a well-nourished animal. Their hair had a glossy and bright appearance. Their nails were smooth, resilient and looked as if polished. General alertness was common to all the children fed on milk. No difference could be detected with regard to these points between the children receiving milk, irrespective of the kind of milk. It was gathered from teachers and janitors that the children receiving milk were much more alert and very much more boisterous and difficult to control than the others. This latter fact was only too evident when they were waiting in small groups to be weighed."

Another member of the committee, Dr. G. W. Simpson, made a different observation. He asked the headmasters to parade the children in their respective groups, he himself being unaware which group was milk-fed or otherwise. From this general survey he placed the groups in order of apparent standard of nutrition. Of five examinations thus made, he found that first places of nutritional standard were accorded to three whole-milk and two separated milk groups. Second places were accorded to two whole-milk and three separated milk groups. Third places were accorded to all five biscuit groups, and fourth places to all five control groups. "The difference in nutrition between groups receiving milk and not receiving milk was plainly evident. No great difference was noticed between the whole milk and separated milk groups."

One very interesting result came out in this repeated investigation. In order to ascertain what would occur, two of the previous feeding groups were reversed. A group which in the original investigation received separated milk now received biscuit. Another group which in the first investigation were "controls" now received whole milk. The general result in both cases was that they changed places; the former milk group now receiving biscuit fell to the biscuit standard, while the former "control" group now receiving milk rose to the milk standard.

The significance of these results cannot be over-estimated, and demonstrate the value of milk to growing children.

The cost of this investigation was defrayed by a grant made by the Empire Marketing Board to the Rowett Institute, Aberdeen.

Retiral of Mr. Walters.—We regret to record the retiral from active service of Mr. J. A. T. Walters, B.A., F.R.S.A., Agriculturist, on account of ill health. Mr. Walters entered the service of the Southern Rhodesia administration in February, 1912, having previously served for several years in the Department of Agriculture of the Transvaal and later of that of the Union of South Africa, where he held the appointment of Assistant Agrostologist. He was one of that band of earlier officials in Southern Rhodesia whose duties before the advent of motor transport and the closer settlement of the agricultural areas entailed considerable hardship. An enthusiastic and capable officer, he never spared himself, and his work has helped materially in the advancement of the agricultural industry of the Colony. During the period of the Great War he was the sole remaining officer in the Agriculturists and Botanists' Branch and was subjected to exceptional mental and physical strain, which probably undermined a constitution none too strong. In March, 1925, he was seconded from the Department of Agriculture to take up the appointment of Land Settlement Officer attached to the High Commissioner's Office in London. While in England Mr. Walters was elected a Fellow of the Royal Society of Arts. A strenuous term of office in a climate to which he was not suited physically resulted in a breakdown in health and for a long while he was seriously ill and incapacitated from duty.

In March, 1928, Mr. Walters returned to this Colony and resumed duty in the Chief Agriculturist's Branch, but after a short spell of office his health again broke down and he has been under medical treatment ever since. He has now retired from the Service on pension and will take up his residence on a farm he has acquired in the vicinity of Salisbury.

We feel sure that Mr. Walters' numerous farmer friends will greatly regret his retiral and will hope to see him restored to health. His colleagues in the Agricultural Department miss his genial presence and will remember him as a loyal friend and a zealous and efficient servant of the Government.

Notice.

Parcels containing samples of soil for analysis and dead poultry for examination are frequently received by the Department of Agriculture upon which a cartage fee of 6d. and an agency fee of 1s. 6d. has to be paid. This charge is subsequently debited to the sender, who is at a loss to understand how it has been incurred. The better plan is to send such parcels by post, which cost the consignor no more than he would pay by railing them, and it is hoped this procedure will be followed in future.

The Ground Nut.

(ARACHIS HYPOGAEA.)

By S. D. Timson, M.C., Dip.Agric. (Wye).

General.—The ground nut, also commonly called the pea nut or monkey nut, which now has a world-wide distribution, was originally discovered in North America and is generally believed to be native to Brazil. It is probable that the plant was distributed from Brazil over the remainder of America, and from thence it came to Europe, Africa and Asia. Cossigny states, however, that it is indigenous to Madagascar and spread from there to India. The Spaniards introduced it to the Moluccas and Philippines by way of the Pacific.

To-day the ground nut is widely distributed through practically the whole of the tropical and sub-tropical regions of the world.

Description.—The ground nut is an annual herbaceous leguminous plant with erect or creeping stems, according to the variety. The leaves are arranged in two pairs of oval leaflets, which are alternately placed on the stem and generally have a fine down of hair on the lower surface, while the upper surface is smooth.

In the erect varieties the fertile flowers are situated in the axils of the lower leaves, but in the creeping varieties the flowers are disposed along the whole length of the stems. They are a bright yellow colour, with reddish striations. The peduncle, or flower stalk, elongates immediately after fertilisation of the ovary and bends over towards the ground, which it penetrates, carrying the ovary with it. As soon as the ovary is below ground it swells and grows out into the well-known fruit or nut, which is an oblong pod of a pale

straw colour and varying in size and the number of seeds it contains, according to the variety.

Bacterial nodules are usually produced freely on the roots, and the plant is a typical legume, in that it can obtain its nitrogen supply from the air by the co-operation of the bacteria in these nodules.

Uses.—The whole of the ground nut plant is useful either as food for man or as stock feed. The shelled seeds contain about 40 to 52 per cent. of oil and 25 to 32 per cent. of crude protein. The oil is extracted by heat and pressure, and it is largely for its oil content that the plant is grown. The residue after expression of the oil is made into a cake, which is a very valuable feed for all classes of farm stock and is particularly valuable for dairy and fattening cattle. The cake made from decorticated nuts contains about 45 to 47 per cent. of crude protein and about 31 per cent. when made from unshelled nuts.

The oil is used very largely in the manufacture of soaps and margarine, and it is said to be equal in quality to olive oil for table use. It is also used in the manufacture of cosmetics, leather dressings and furniture creams.

After the removal of the pods at harvest the remainder of the plant provides a nutritious and palatable hay, or, where the maintenance of the nitrogen and humus content of the soil is of first importance, it can be returned to the soil and ploughed under. Usually the hay is of greater value as a stock food than for its soil restorative properties.

The following analyses indicate the composition of the various parts and products of the plants:—

	Water.	Crude protein.	Fat or oil	Carbohydrates.		Ash.
				Soluble.	Fibre.	
1. Seeds only	7.48	28.53	43.75	9.53	3.5	2.38
2. Shells ,,	9.0	6.6	1.6	15.1	64.3	...
3. Seeds with shells	6.0	23.7	34.2	17.5	15.9	2.7
4. Hay vines only	9.5	10.5	1.3	39.8	27.0	11.9
5. Hay vines and nuts	7.8	13.3	10.4	37.4	24.3	6.8
6. Ground-nut cake (U.S.A.)	10.7	47.6	8.0	23.7	5.1	4.9
7. Ground-nut cake (Rhod.)	9.6	45.0	10.7	30.7		4.0

1. *P. de Sornay: Green Manures and Manuring in Tropics (average of 5 varieties).*

3. *Mauritius.*

4. *Rhodesian.*

5 & 6. *Henry & Morrison: Feeds and Feeding.*

7. *Division of Chief Chemist (average of 6 analyses).*

Varieties.—The numerous varieties of ground nuts fall naturally into two main groups, namely: (a) the bunch or erect-growing varieties, and (b) the runner or prostrate or creeping varieties.

In the course of a number of years variety trials carried out on the Salisbury Experiment Station have demonstrated that as a whole the runner varieties give a somewhat higher yield of nuts than the bunch type, but this advantage is more than counterbalanced by the extra cost of harvesting the runner varieties and the fact that many more empty pods are produced by these varieties. The bunch types of nuts are recommended for commercial cultivation, though where pigs are to be pastured on the nut crop, the runner variety may be preferred.

When the export market for the street barrow and confectionery trades is aimed at, the nuts should be grown on a type of soil which does not stain the shells, as a clean white shell is essential for this market if the best prices are to be obtained. Nuts the shells of which are stained are suit-

able for oil extraction, as the staining does not affect their value for this purpose.

Of the bunch varieties, the Spanish Bunch and the Virginia Bunch have proved the most suitable types for this Colony. The former produces rather more oil per acre than the latter, whereas the Virginia Bunch gives a somewhat larger yield of protein and hay.

The Spanish Bunch has been exported to England for a number of years, and is said to meet all the demands of the confectionery, street barrow and oil milling trades when the nuts are well developed and properly prepared for market. As far as the writer is aware, the Virginia Bunch type of nut has not yet been placed on the English market from this Colony, although there is every reason to believe that they would be just as suitable for this market as the Spanish Bunch, and possibly more so. A well known Rhodesian farmer investigated this point when on a recent visit to England, and came to the conclusion that there was some preference for the larger type of nut, such as the Chinese or Virginia Bunch, for the confectionery and street barrow trades.

If this is so, the growing of Virginia Bunch might present the following advantages over Spanish Bunch, though the matter requires still further investigation. The cost of picking from the vines and of selection for export should be less; the percentage of exportable nuts should be somewhat higher, and the total yield per acre should be appreciably greater. In addition, the yield of hay for consumption on the farm would be greater. The Virginia Bunch should be the more profitable type to grow where the entire crop is consumed on the farm, as the acre yield of protein and hay is greater than from Spanish Bunch, though the latter gives the higher acre yield of oil.

Whatever the type grown, if the nuts are to be exported to England they should (1) be grown on soil which does not stain or adhere to the shells, and should be thoroughly cleaned, and (2) be carefully sorted and graded.

The writer is informed on good authority that carefully graded nuts in clean shells have on one occasion obtained a price on the English market which was equivalent to slightly

Ground nut variety trials.

The growing crop in duplicate plots. Twenty varieties have been included in these trials, which have been extended over a period of five years.

over 4s. 6d. per bag of 75 lbs. more than other consignments, marketed at the same time, which were ungraded and had stained shells. In another case a mixed consignment of Spanish Bunch nuts, grown partly on sandy soil and partly on red soil on the same farm, were recently marketed together. Both lots were carefully graded, and in addition the red soil lot was washed. On being sold the sandy soil nuts were sold at 31s. per cwt. and the red soil nuts at 25s. per cwt. The only difference between the two samples lay in the colour of the shells. The benefit of grading nuts for export trade and marketing them in clean shells is therefore obvious, and farmers are strongly urged invariably to do this when export is intended. It will probably make the difference between a good profit and little or none.

The following tables, giving the results of variety trials and a classification and comparison of different types of nuts grown in this Colony, are extracted from the report of the Salisbury Agricultural Experiment Station for the season 1927-28, compiled by the Manager, Mr. H. C. Arnold:—

Variety Trials carried out at the Salisbury Agricultural Experiment Station.—These trials have extended over a period of five years, during which time several new kinds have been tested against other varieties which are more commonly grown in the Colony. About twenty different strains have been included in these trials, most of which have been received through the courtesy of the Department of Agriculture of the Union of South Africa and of the United States of America. They include six kinds with prostrate stems and fourteen with upright stems. Owing to their spreading habit, those with prostrate stems or "runners" produce their nuts over a comparatively large area, and for this reason all operations connected with the harvesting of the nuts are rendered more laborious than they are with the "bunch" varieties, the nuts of which are clustered near the base of the stem. The returns show that the yields of the "runner" varieties are usually heavier than those of the "bunch" type, but because they produce a larger percentage of immature nuts and are more expensive to reap, the "bunch" varieties are believed to be more profitable for cultivation on a commercial scale.

Yields in lbs. of Unshelled Nuts per Acre.

Name of variety.	Average yield over 3 seasons. 1923-26.	Yield, 1926-27.	Yield, 1927-28.	Average yield over 5 seasons.	Percentage of nuts (kernels) to unshelled nuts (pods).
Runner varieties—					
Jumbo	2,123	2,930	2,900	2,440	62
Virginia runner ...	1,920	2,710	2,840	2,262	70
Gambia	1,767	2,400	2,450	2,048	61
Large Japanese ...	1,630 (1 season)	2,500	2,410	1,960 (3 seasons)	62
Mammoth ...	2,570	2,850	3,240	2,887	62
Chinese	2,250	2,680	2,810	2,580	68
Bunch varieties—	(3 seasons)			(5 seasons)	
Virginia (Victoria, S.R.)	1,560	2,780	3,020	2,096	69
Virginia (U.S.A.)	1,717	2,450	2,540	2,028	70
African (Union) ...	1,703	1,860	2,140	1,822	75
Natal (Union) ...	1,540	2,320	2,120	1,812	75
Tennessee Red (Union) ...	1,450	2,050	2,480	1,776	75
Spanish (Rhodesia)	1,467	1,780	2,390	1,714	75
Tennessee Red (Agr. Exp. Stn.)	1,333	2,070	2,410	1,696	75
Virginia (Union) ...	1,430	1,650	2,490	1,686	75
Valencia (U.S.A.)	1,410	1,820	2,210	1,652	75
Spanish (Union) ...	1,333	1,980	2,270	1,650	74
Improved Spanish (U.S.A.) ...	1,327	2,200	1,870	1,610	7
Java White ...	1,417	1,780	1,930	1,592	76
Spanish 11-25B (U.S A.) ...	1,250	2,130	2,030	1,582	75
Spanish (Que Que)	...	1,890	2,360	...	75

For the purposes of comparison the majority of the "bunch" varieties may be divided into three groups, and the

six "runner" varieties may also be similarly classified. The members of each group are similar in habit of growth, shape of pods, number of kernels in the pods and colour of skin of kernels, etc., so that for practical purposes the members of each group may be considered to be identical with one another. Thus, "Chinese" is the same as "Virginia Runner," "Gambia" the same as "Large Japanese" and "Mammoth" the same as "Jumbo."

Ground Nut Varieties Classified and Described.

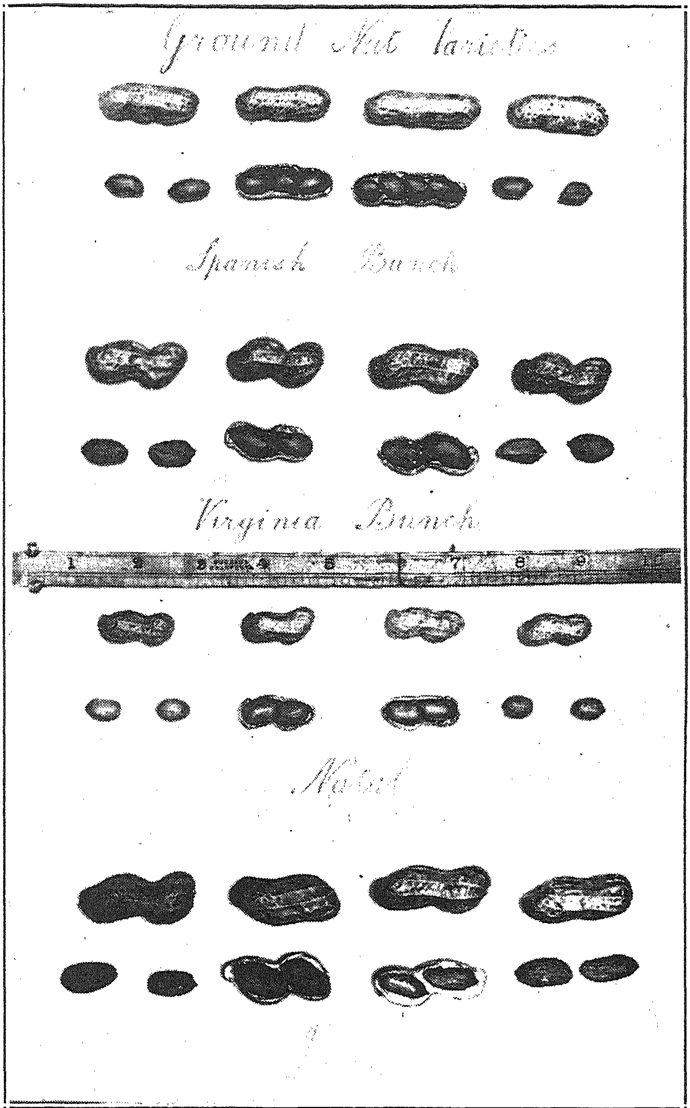
Group I.	Group II.	Group III.	Group IV.
Spanish (Rhodesia)	Virginia Bunch (U.S.A.)	Natal	Mammoth
Virginia (Union)		Improved Spanish	Jumbo
Valencia	Virginia Bunch (Victoria, Rhodesia)	Java White	
Tennessee Red (Agr. Exp. Stn.)		Spanish 11-25B.	
Tennessee Red (Union)			
African			

	Group I.	Group II.	Group III.	Group IV.
Type of growth ...	Bunch	Bunch	Bunch	Runner
Period of growth ...	130 days	145 days	130 days	155 days
Average acre yield ...	1,690 lbs.	2,060 lbs.	1,650 lbs.	2,440 lbs.
Number of nuts in pods	2 to 4	2		2
Percentage of nuts to pods	75	69	75	63
Approximate length of nuts	9/16 in.	13/16 in.	8/16 in.	14/16 in.
Approximate diameter of nuts	5/16 in.	6/16 in.	11/32 in.	6/16 in.
Colour of skin of nut...	deep red	light red	pale pink	light red
Weight of nuts per 1,000	18 ozs.	32 ozs.	19 ozs.	34 ozs.
Percentage of oil in nuts	49.43	43.26	49.18	43.67
Percentage of protein in nuts	27.56	28.75	28.12	27.43

Best quality ground nuts are used by the confectionery trades, and these have a very considerably higher market value than nuts of lower quality whose chief value is in the oil which they contain. The residue of the nuts which remains after the oil has been extracted provides a concentrated stock feed rich in protein, and invariably commands a high price. The crop may also be grown for stock feed. The merits of the various groups for these purposes may now be considered. The following tabulation illustrates the comparative merits of Groups I., II. and IV. as oil and protein producers:—

	Average yield per acre of unshelled nuts. Lbs.	Percentage of nuts to pods. Per cent.	Yield, nuts per acre. Lbs.	Nuts contain: Oil. Per cent.	Nuts contain: Protein. Per cent.	Yield per acre, oil. Lbs.	Yield per acre, protein. Lbs.
Group I.—Type, Spanish bunch	1,690	75	1,265	49.43	27.56	625	349
Group II.—Type, Virginia bunch	2,060	69	1,420	43.26	28.75	614	408
Group IV.—Type, Jumbo ...	2,440	62	1,510	43.67	27.43	659	414

This table shows that, although the Spanish Bunch variety yields a few hundred pounds less of unshelled nuts per acre than the other kinds, owing to the low proportion of husks and the high percentage of oil in the nuts, its acre-yield of oil is about the same as that of the others. Farmers who wish to utilise the whole of their crop for stock feed may find the Virginia Bunch the more suitable kind, because it produces a larger quantity of top growth and its nuts contain a slightly higher percentage of protein. From observations made here the Virginia Bunch appears to be more drought and disease resistant than the other kinds, so that in areas of lower rainfall it might prove to be the more profitable one to grow for nuts which are destined for the oil factory. The heaviest yields are obtained from the varieties in Group IV., but because of their prostrate habit of growth, their slightly higher yields would be off-set by the extra expense involved in lifting and gathering the nuts. Only in exceptional cases would this kind be the most profitable one to grow, for example, (a) when the crop is to be "harvested" by pigs; (b) when, owing to the very loose texture of the soil, the vines with the nuts attached could


Ground Nut Varieties
Spanish Bunch
Virginia Bunch

be harvested without previously breaking up the land. The varieties enumerated in Group III. cannot be recommended, because their yields are lower than the others and their pods are smaller, making the work of separating them from the vines more tedious; thus, although their quality is high, they would be less profitable to grow. It should be noted that the variety known as "Spanish Bunch" in this Colony is identical with that which appears to be called "Virginia Bunch" in the Union of South Africa, but is quite distinct from the "Virginia Bunch" mentioned in this report.

Climate and Soil.—It may be said that, save in exceptional seasons, the climatic conditions over the whole of Southern Rhodesia are suitable for the successful cultivation of ground nuts during the summer season. A well distributed rainfall of 20 to 25 ins. is sufficient for the needs of the crop, but it is also an excellent drought resister, and good yields of nuts have been obtained with a considerably lower rainfall than this.

The plant is sensitive to frost and does not thrive on heavy clay soils, while a waterlogged soil is fatal to its development.

Practically the whole of the sandy soils of this Colony, which are well drained and do not tend to become waterlogged, are suited to produce good yields of this crop when it is grown in rotation with other crops and where the land receives a moderate dressing of farm manure, or is green manured once in four to five years. The more fertile of these sandy soils, if properly managed, are almost ideal soils for the crop, as their free working nature renders easy the penetration of the fruiting stalks and the development of the nuts and the subsequent lifting of the mature crop. In addition, such soils do not adhere to or stain the shells, and, as already stated, this is an important point where the farmer intends to export his nuts. Although a deep, fertile and free-working sandy loam is the best type of soil for this crop, yet excellent yields can be obtained on the heavier red and chocolate soils, providing they are in fair physical condition. In such cases, however, the shells become stained and the cost of production is raised, as the crop requires more frequent earthing up, while lifting is more costly.

Ground nuts will usually give a better return on virgin soils than maize, especially if a dressing of phosphatic fertiliser, preferably superphosphate or rock phosphate, is applied.

Manuring and Fertilisers.—On soils on which the crop produces root nodules freely it can obtain the whole of the nitrogen required for its growth from the air, and so the chief fertiliser requirement of the crop is a supply of phosphates and potash.

The ground nut should always be grown in rotation with other crops, and is best situated in the rotation where it can utilise the residues of phosphates and potash applied to a previous crop. Normally the supply of potash in the soils of this Colony may be sufficient, but the possibility that additional supplies in the form of artificial fertiliser may be profitable should not be lost sight of, especially in the case of soils which have been worked out or on the lighter sands which are naturally inclined to be deficient in this constituent.

Experience on the departmental and municipal experiment stations and amongst practical farmers leads to the general conclusion that the ground nut crop normally needs only the addition of phosphates, and that where this is applied direct to the crop it is best supplied in the form of superphosphate. It is possible that basic slag may give better results where the soil is acid, owing to the free lime contained in this latter fertiliser, but this is a point which the farmer must decide for himself by actual field trials.

In whatever form the phosphates are supplied to the plant, they tend to stimulate the development of the root system of the plant and to cause the crop to mature more rapidly.

In the case of all legumes, including this crop, a readily available and ample supply of phosphates is particularly necessary for the following reason: The bacteria which live in symbiotic union with the plant in the characteristic nodules on the roots can only invade the young roots from the soil when in the motile form, and they can only pass into this form when the supply of available phosphates is ample. Therefore where the soil is lacking in this constituent the addition of a sufficient supply stimulates the nitrogen gather-

ing bacteria to change into the motile form, and thus accelerates their invasion of the roots. Thus their working life in co-operation with the legume is materially lengthened, and the amount of nitrogen fixed by them is increased to the benefit of the host plant and succeeding crops.

The ground nut, in addition to phosphates and potash, requires a good supply of humus. This may be maintained in the soil by the application of kraal or farmyard manure to preceding crops in the rotation, or by the ploughing under of a green manure crop. Except where ground nuts are the main cash crop, which is very seldom the case in this Colony, and where the soil is particularly deficient in humus, ground nuts should not follow immediately after the application of farm manure or a green manure crop, as this may lead to excessive top growth and an abnormal number of ill-filled pods.

An experiment designed to test the effect of applications of farm manure on the ground nut crop was carried out during the seasons 1925-26 and 1926-27. Two plots were each dressed with 9 tons per acre of manure, and a third plot received no treatment. The land was planted to ground nuts in both seasons, with the following results:—

Season.	Plot 1, 9 tons per acre of manure.	Plot 2, no manure.	Plot 3, 9 tons per acre of manure.	Increase resulting from the manure. Average of 2 plots.
1925-26 ...	30.0	22.8	33.6	9.0
1926-27 ...	19.4	15.8	20.5	4.1

The yields are expressed as bags per acre—75 lbs. of unshelled nuts per bag.

These results show that an application of 9 tons per acre of farm manure gave an increase in yield over two years of 13.1 bags per acre, and an increase in yield of hay of $\frac{1}{4}$ ton in addition. It is not considered that this increase in yield justifies the application of such a heavy dressing of farm manure, and that the latter would give a better return if applied to the maize crop in a rotation.

These results are not conclusive in themselves, but they are supported by similar results obtained in other countries,

and a new series of experiments was recently commenced at the Salisbury station designed to discover the most suitable dressings of artificial fertilisers for the ground nut crop. These experiments have not been in progress long enough to give conclusive results, but the indications are that an application of 200 lbs. per acre of superphosphate will give the best economic result on good red soil. The addition of potash and nitrogen gave no economic increase in yield.

Where wood ash is available, this may be applied at the rate of ½ to 1 ton per acre. However, analyses by the Chemical Division of this Department of 16 samples of ash obtained from indigenous timber, and stored under varying conditions, give the following variation in composition of the material.

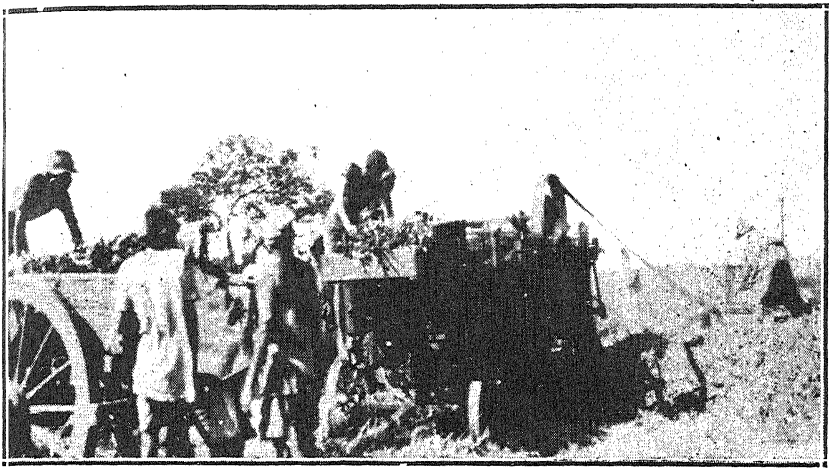
Lime (CaO), 18.37 to 49.33 per cent.
Potash (K_2O), 0.41 to 5.22 per cent.
Phosphoric Oxide (P_2O_5), 0.41 to 5.22 per cent.

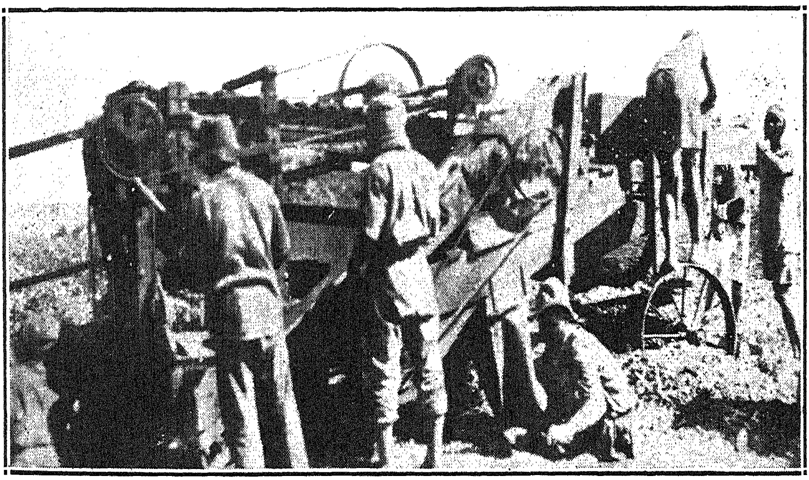
It is therefore obvious that where a farmer has large supplies of this material available he should take a carefully mixed bulk sample and cause an analysis of it to be made. He will then be able to apply the ash in the proper quantities to his land.

Use of Lime.—For several years liming experiments with various crops, including ground nuts, have been in progress at the Salisbury Agricultural Experiment Station. Applications of lime have varied from ½ ton to 3 tons per acre; in some cases applied as single dressings, sometimes as smaller dressings over a period of several years. The possibilities of liming have been well explored, but no consistent increase in yield per acre nor any other desirable result has been associated with this practice at present, nor when lime has been applied in conjunction with farm manure applied at the rate of 8 tons an acre to this crop.

It is probable that applications of lime would have a beneficial effect on the ground nut crop where the soil has a very definitely acid reaction, but no such result has at present been recorded in this Colony as far as the writer is aware.

Method of Application of Fertiliser.—Since the seasonal climatic factors are so variable, both from season to season





Ground nut picker being driven by tractor at the Gatooma section of the Mining, Ranching, Cotton, Tobacco & Land Company of Rhodesia, Limited's, Estates.

and within each season, it is doubtful whether the question of the best method of applying fertilisers to the ground nut and other drilled crops in this Colony can ever be definitely settled. Probably in a season of ample rainfall, which is well distributed, with no partial droughts during the growing period, the quick-acting fertilisers such as superphosphate or bone and superphosphates will give the best results when the whole dressing is applied in drills by the planter attachment. But it is seldom if ever that the farmer is blessed with such a season, and so, where the seasonal rainfall is apt to be low, broadcasting the fertiliser and disc-harrowing it in before planting is a safer method, as there is then no danger of the crop being forced and subsequently suffering unduly from the effects of a drought. Without entering into all the pros and cons of the matter, the writer is strongly of the opinion that the best system is to broadcast and disc in two-thirds of the fertiliser before planting and to apply the remaining third to the plants in the drills by means of the fertiliser attachment on the planter. Care should be taken to see that the fertiliser is not allowed to drop directly on to the seed, as this will cause "burning" and will adversely affect the germination.

In districts where planting rains are usually late the need for rapid planting as soon as the opportunity arrives is all-important, and in such cases it is advisable to broadcast all the fertiliser before the crop is planted, since this avoids the delay when planting caused by the refilling of the fertiliser hoppers. It may be pertinently pointed out here that the application of only one-third of the dressing by means of the planter reduces such delays very considerably. Another method of reducing this delay at planting time is to arrange to carry a sack of fertiliser on the planter or on a light trailer drawn behind the planter. This saves carrying the fertiliser from the field side.

The Ground Nut in a Rotation.—Ground nuts are not an exhausting crop, but on the other hand they do not appear to have any direct beneficial effect on a following maize crop where the whole of the ground nut plant is removed from the soil at harvest. In this connection it is pertinent to note that although this crop, like other legumes, can obtain all the nitrogen it requires from the air, yet if there are readily

available supplies of nitrogen in the soil, the crop will utilise a proportion of this nitrogen and will obtain only a part of its nitrogen supply through the co-operation of the nodule bacteria on its roots. The greater the supply of available soil nitrogen, the less will the nitrogen of the air be utilised. In parenthesis one may mention that this explains many cases of legumes producing very few nodules on their roots. It is clear, therefore, that in a rotation of crops the ground nut should normally occupy a position as remote as possible from the green manure crop or the crop to which farm manure or an organic nitrogenous fertiliser has been applied, always bearing in mind, however, that an adequate supply of humus in the soil is most necessary.

The following rotation has been employed on the Municipal Experiment Station at Gwelo for the last five years, and, as is shown by the results, the fertility of the soil has been fully maintained or increased. The proper position of the ground nut crop in a rotation is well illustrated:—

	1928-29.	1925-26.	1924-25.	Average yield per acre over 5 years.
Velvet beans ploughed under	...	...	...	...
Maize + 200 lbs. bone and superphosphate per acre (after velvet beans) ...	21.15	21.0	14.5	15.78
Maize (after maize and fertiliser) ...	18.95	12.0	13.0	12.79
Ground nuts + 200 lbs. superphosphate per acre (after maize)	21.6	23.0	Sudan grass	19.2

Yields are in bags per acre. The soil is the average red soil of the Gwelo district.

Finally, it should be mentioned that under ordinary farming conditions two or more successive crops of ground nuts on the same land have invariably been found in Rhodesia to result in very poor yields from the second or third successive crops, no matter how good a return was obtained from the first crop.

Preparation of the Land.—Although ground nuts will often produce quite good crops on land which has been indifferently prepared, yet very much better returns will repay the extra labour and expense involved in a proper preparation. The general lines of the operations necessary to bring the soil into the right condition for planting ground nuts are much the same as those required for the maize crops. Ploughing in early autumn down to 6 to 9 ins. deep or as deep as local conditions will allow is advisable, and the plough should be followed immediately by a corrugated roller, spiked roller or disc harrow. In this way the large clods turned up by the plough can be broken down to a tilth before they dry out and harden. If the harrowing or rolling is delayed for even an hour or two it frequently happens that it becomes impossible to break up the clods until six or seven months later, after the spring rains have softened them. A fine tilth at this time is not needed and may even be harmful when the spring rains arrive, since the surface soil may pack and the water may not penetrate quickly to the sub-soil, while much surface soil may be washed away in consequence. The land can be left rough until spring, when the first good rains will make it possible, by the use of disc and drag harrows, to work the soil into a fine friable condition.

On those sandy types of soil which set very hard in autumn on drying out, or if it is not found possible to carry out autumn ploughing, there is still ample time after the arrival of the rains in spring to plough and prepare the land as outlined above, since ground nuts need not be planted until about the middle of December.

If the soil is stiff, extra care is needed to ensure a fine loose tilth before planting. If this is not done, poor stands and poor crops will result. On free-working sandy loams, which are ideal soils for this crop, little difficulty will be experienced in preparing the land. At all times clean land should be chosen for this crop and clean cultivation should be practised. Nothing tends more to lower the yield than an over-crowding by weeds, and by "rapoko" grass in particular.

Planting.—Seed is usually planted on the level, for if the soil is so ill-drained as to require ridging before planting, it is better not to plant on that land at all, but to select

another site, for it is very unlikely that on such soil good returns will be obtained. Planting may be done either by hand, if the labour supply allows, or by the maize planter fitted with special ground nut plates.

It has been clearly demonstrated at various experiment stations in this Colony that a spacing of 18 ins. between the rows and of 6 to 8 ins. between plants in the row will give the highest return of nuts per acre. Therefore, if the area to be planted is not large, or if the labour supply and other considerations allow, the crop should be planted by hand at the above spacing.

The following table shows the results of distance of planting trials carried out on the Salisbury Experiment Station:—

Yields of Unshelled Ground Nuts in lbs. per Acre.

Spacing, 1919-24.	Average yield of unshelled nuts per acre.	Spacing, 1924-26	Average yields over 2 seasons.
18 by 6 inches	1,560 lbs.	18 by 8 inches	1,548 lbs.
24 „ 6 „	1,162 „	24 „ 8 „	1,250 „
24 „ 10 „	(One year only) 1,034 lbs.	30 „ 8 „	1,192 „
30 „ 8 „	1,184 „	36 „ 8 „	1,076 „

Where the crop is planted by hand at a spacing of 18 by 6 to 8 ins., the weeding and earthing up must necessarily also be done by hand. However, the closeness of the planting enables the leaves and stems of the plants quickly to cover the spaces between the rows, and this reduces the amount of weeding necessary. Over larger acreages, or where the labour supply is insufficient, the crop may be planted by machine, but the spacing should approximate as nearly as possible to the optimum. Where a tractor or very steady planter oxen are available, the planter should be set at 42 to 44 ins., and the ground gone over twice, on the second occasion splitting the rows and finally giving a planting with rows 21 to 22 ins. apart. This will give sufficiently straight planting to allow of machine cultivation between the rows after the plants are up above ground.

When unsteady oxen are employed for drawing the planter a slightly wider spacing of 24 to 28 ins. between the rows may be necessary. A still better arrangement is to arrange two planters behind the tractor, one behind the other in echelon, so that the rows planted by the leading planter are split by the rear planter. There should be no insuperable difficulty in adapting this method for use with oxen. Even if six oxen are needed to draw the two planters, the advantage obtained by having the rows correctly split outweighs the disadvantage of having to use two extra oxen.

Where planting is done by hand the field may be marked out beforehand by running two planters over the land and then digging the holes on the wheel marks at the requisite interval of 6 to 8 ins.

A 3-Row Planter Needed.—There is distinct need in this Colony for a 3-row planter in which the two wheels and the two outer planting units are adjustable to within 18 ins. of the centre one, whilst the latter remains stationary. Such crops as ground nuts, Soya beans, peas, Sunn hemp for seed and cowpeas for hay require an optimum planting distance between the rows of considerably less than the minimum setting possible on any of the planting machines at present marketed. The design and manufacture of such a planter should present no great difficulty, and it is to be hoped that some of our manufacturers will soon supply this want.

Shelled nuts should always be used for planting, and they should be carefully picked over to remove cracked kernels or those of which the skin is broken. Many farmers complain that they have a large proportion of kernels cracked when planted by machine, and the following hints will assist them to reduce the breakages to a minimum and so ensure good stands of plants—a matter of the greatest importance.

(1) The spring should be removed from the "knocker" of the planter. In some cases the pressure of this spring as the kernel passes through the hole in the plate is sufficient to break a proportion of the nuts. In some cases it is best to remove the knocker itself, and in other cases the weakening of the spring is sufficient.

(2) The gearing of the planter should be altered, if possible, to give a slower movement of the planting plate.

This helps to give the nuts sufficient time to drop through the plate without being caught in the mechanism. This may necessitate the use of a different plate with more holes than the normal plate possesses.

(3) The following treatment of the seed nuts is claimed to reduce the breakages during planting to a negligible quantity and is well worth a trial. The seed nuts, contained in a sack, are dipped in water and moved about under the water, so as to wet them thoroughly, for a period of about one minute. They are then removed from the sack and spread out in a thin layer on sacking or bucksails in the shade to dry partially. This process must be done the evening of the day before planting of the nuts is to be done.

It is said that the wetting the nuts receive has the effect of toughening the thin skin, thus preventing their cracking without harming them in any way. One farmer who uses this method wets the nuts as required in a metal tub placed at the side of the field, then spreads them on a sack in the sun, where they dry rapidly, and then uses them immediately. Whichever method is used, the object is to moisten the nuts and then dry them just to the stage where they are not obviously wet, but the skin is still moist enough to be rendered tough. One farm implement firm has recently placed on the market a special type of planting attachment, in which the special features are the use of a brush instead of a "knocker," and the setting of the oblong planting holes obliquely to the periphery of the plate. The plate is also of extra thickness round each hole. It is claimed that this attachment ensures the planting of the nuts without breakage.

Sufficient has been written above to emphasise the need to make every effort towards obtaining a stand of plants as near the optimum spacing distance as possible. At present it is the exception rather than the rule to see a crop of machine planted ground nuts with more than a 50 per cent. stand of plants, and this largely accounts for the poor yields obtained. The seed should be planted to a depth of 1 to 3 inches, the deeper planting being used in dry soils, or in loose sandy soils. Shelled seed should always be used, as the use of unshelled seed is wasteful, and leads to very irregular and imperfect germination. About 40 to 50 lbs. of shelled seed is required to plant an acre.

Cultivation and Earthing Up.—As soon as the rows can be seen cultivation should commence, and should be done thoroughly and often enough to keep weeds completely under control. It should continue until the flowers fall and the stalks turn down to enter the ground. After this no further cultivation should be given. It may be necessary to hand weed the crop once or twice if weeds in the rows are very troublesome. A thorough harrowing immediately preceding planting, and early cultivation, will reduce the hand weeding necessary. As soon as flowering commences, to assist the penetration of the soil by the fruiting stalks, the crop should be gradually earthed or ridged up, a small amount of loose earth being thrown over the crowns of the plants without covering the foliage. This is of particular importance where the soil is liable to form a crust, or is naturally stiff in texture. The wing shovel plough may be used for this work.

Harvesting.—The yellowing of the leaves is a sign of the approaching maturity of the crop, and soon after this commences it will be ready to lift. Lifting must not be delayed too long, as heavy frosts render the foliage brittle and difficult to gather for hay, and of inferior quality. The earlier formed pods are also in danger of sprouting, and some may be left in the ground owing to the stalks becoming too brittle. On the other hand, lifting must not be done too soon, as the nuts may not be properly filled out. When reaped at the proper time, a yield of about ¼ ton of palatable, nutritious hay in addition to the nuts is obtained.

The crop is usually lifted by hand, being pulled straight out of the ground on the lighter soils. When the soil has dried out and become hard, or on the heavier types of soil, it may be necessary first to loosen the soil around the plants by means of a hoe or by running a one-furrow plough along the side of the row.

Where the crop is grown on a large scale or where labour is scarce, mechanical harvesters must be used, but these are not usually satisfactory unless the soil is moist or naturally loose and friable. Potato diggers and single-furrow ploughs, with or without the mouldboard, preferably the former, may be used. After lifting the plants are thrown into loose windrows and left for a few days for the foliage to wilt. The leaves cure quickly, but the stems dry more slowly, and it is

therefore best to build the nuts into hollow conical cocks about 3 to 4 feet high, with the nuts inside. They may be left in the cocks for two or three weeks, to allow the succulent stems and the nuts to dry properly, and the immature nuts to continue filling out to some extent. The foundation of the cocks should consist of plants with nuts placed uppermost, and they may be capped by plants with the nuts downwards. If late rains are feared the cocks may be kept off the ground by building them on brushwood.

On hard soil one native can lift about 1,000 yards of the crop, and on lighter or moister soil may cover 1,500 yards in the day. In cocking from the windrow, three to five acres per native per day may be done. When the shells of the nuts are properly dry and the nuts firm, they may be picked, bagged and ridden to the store. Under good conditions one native can pick 80 to 90 lbs. of nuts from the vines per day.

Throughout harvesting, the plants should be handled with care to avoid loss of the foliage, and the hay should be bagged as soon as the nuts are picked, as its quality is almost equal to lucerne, and it is therefore of considerable value in this Colony.

The Benthall ground nut mechanical picker has been successfully operated in Rhodesia on the estate of the London and Rhodesian Mining and Land Company near Gatooma, and a short report on this machine was published in the issue of the *Rhodesia Agricultural Journal* for September, 1928. The price of this machine is, however, high, as without driving power the cost is £260 to £290. This is more than the majority of farmers can afford, but there is an opportunity here for the private contractor, who could travel from farm to farm, as is done with power shelling outfits for maize. It should also be possible for a number of neighbouring farmers to purchase a machine co-operatively and to operate it by means of a farm tractor.

Seed Selection.—Seed selection is of the same importance with this crop as with maize, and this is best done in the field at harvest. One of the best portions of the crop should be selected, where the stand is as full and even as possible. Extra care should be taken in lifting so that the nuts are not broken from the plants, and the plants with nuts adhering to them should be laid in rows on the ground with the nuts

exposed. Those plants which have an exceptional crop of perfect nuts, and good growth of clean foliage, and with a majority of pods containing the proper number of kernels (three or four in the case of Spanish Bunch), are selected and laid aside. Only plants which have been in fair competition with other plants should be selected.

The nuts from these selected plants should be picked carefully to avoid injury, and carefully stored, sufficient being collected to plant one or two acres the following season on a separate propagation plot. The following year sufficient seed is selected from this plot in the same way to plant a further propagation plot, and the balance of the nuts is used for planting the main crop. The process should be repeated each year, and should result in a progressive improvement in the yielding power of the crop. This system of selection does not necessitate the expenditure of much time and labour. It has been used in America with considerable success and will well reward the farmer.

Yields.—In Rhodesia, under normal conditions, 12 to 18 bags of unshelled nuts an acre is an average yield, and when the land is well farmed and in good seasons, yields of 25 to 35 bags an acre are not unusual. Mundy, in his "Sub-Tropical Agriculture," records an instance of a yield of over 400 bags from 10 acres of land. Yields up to 43 bags per acre have been recorded on small plots on the Salisbury Experiment Station, and the average yield obtained there is about 35 bags per acre. The average yield for the whole Colony is only seven to eight bags, which indicates either a lack of knowledge or neglect of proper methods of the cultivation of this crop. The average yield per acre in India in the years 1925 and 1926 was 16 bags, where the nuts are grown by small native growers. In the United States the average yield per acre is over 35 bags of 75 lbs. each.

It is therefore obvious that there is something radically wrong with the Rhodesian farmer's methods of growing ground nuts, when the average yield throughout the country does not exceed 8.4 bags per acre.

Pests and Diseases.—The crop is remarkably free from pests and diseases in this country. Continuous hot, moist conditions favour the development of a leaf spot disease, caused by a species of Cercospora, but it seldom causes much

damage and is not often severe. It may be controlled by spraying the crop with Bordeaux mixture and by the rotation of crops. Cutworms occasionally cause some loss, but are seldom very troublesome.

Production.—The following figures are extracted from the annual reports of the Statistical Department of Southern Rhodesia. The most recent figures available of the production of ground nuts in this Colony are those up to and including the year 1927-28, as shown in the table below:—

Year.	Acreage.	Yield in bags.	Yield per acre.
1923-24	5,881	34,895	6.0
1924-25	5,067	32,466	6.4
1925-26	6,175	52,058	8.4
1926-27	7,813	65,934	8.4
1927-28	6,882	51,220	7.4

The estimated acreage for 1928-29 was 11,600 acres under the crop.

India is the chief producing country in the world, and despite the large acreage under cultivation, the acre yield is high, as shown by the following table:—

Year.	Acreage.	Tons of nuts in shell.	Yield per acre in bags of 75 lbs.
1924-25	2,885,000	1,485,000	16.0
1925-26	3,973,000	1,999,000	16.0
1926-27	4,292,000	2,035,000	14.0

The following table gives the export of ground nuts from the principal producing countries in a recent year:—

Country.	Export in short tons.
British India	497,000
British West Africa	218,700
British East Africa (Tanganyika) ...	17,800
French West Africa	532,500
Dutch East Indies	14,000
China	170,000
Total	1,450,000

The world's total would be about 1,700,000 tons.

The imports of ground nuts of some of the principal importing countries are shown below for the year 1927:—

Country.	Short tons.	Value.
*France	739,849	£10,069,000
Germany	465,000	8,365,000
*United Kingdom	54,681	955,000
Italy	143,527	3,024,000
Netherlands	92,992	1,586,000

Marketing.—The need for proper preparation of the crop to meet the requirements of the confectionery and street barrow trades has already been emphasised elsewhere in this article, but the following necessarily brief remarks on the marketing of the crop may be of interest.

Some of the overseas buyers have expressed the opinion that a proper system of Government grading and branding of our crop for export would go far to ensure better and more regular prices for the nuts, but there are considerable difficulties in the way of this, although they should not be insuperable.

A further point emphasised by authorities on the English market is the need of regular supplies and in greater quantities. The introduction of standard grades and regular supplies of our nuts would save much delay in marketing the crop, which could then be sold afloat before arrival and without the delay necessary when it is sold on sample, as is the case now, and buyers would gain confidence in our products.

At present the cost of marketing the crop overseas after arrival at the railway is very high, and seems to vary between about 6s. to 8s. 6d. per bag of 75 lbs., which is considerably more than the cost of production. These figures refer to the marketing of small consignments of a few hundred bags of unshelled nuts. Recently in England prices for nuts for the confectionery and street trade have ranged from 23s. per cwt. up to 31s. per cwt., the latter price being obtained for white-shelled, hand-picked nuts of the Spanish Bunch variety.

The average price of ground nuts imported into the

*The above quantities are expressed as far as possible in terms of undecorticated (unshelled) nuts.

United Kingdom during 1926 was 13s. 11d. per bag of 75 lbs. decorticated and 11s. 2d. per bag of undecorticated nuts.

The average local prices in bags of 75 lbs. for the year ended September, 1927, were as follows: Unshelled, 9s. 6d. to 11s. 6d.; shelled, 15s. to 18s. 9d.

The price offered this year by local millers after the harvest of the crop was 7s. per bag of unshelled nuts, but supplies were not forthcoming. The price rose later to round about 8s., but supplies were still slow in coming in. The fact that supplies on the local market are short is somewhat surprising, as the acreage under the crop last season was estimated to be nearly double that for 1927-28.

If the dairy farmer or the farmer who is fattening stock can make a satisfactory arrangement with local millers to exchange his nuts for ground nut cake, it would pay him best to do this, as the cake has a much higher feeding value for his purposes than the meal ground from the nuts in the shell. The former has a protein content of about 45 to 47 per cent. and the nuts in the shell only about 27 per cent. The nuts in the shell also contain too much oil to make a really satisfactory feed for the above purposes.

Where the crop has to be ridden long distances to the railway it will undoubtedly pay the farmer to shell on the farm, as he will save the cost of about 25 per cent. on the bags required to contain his crop. One of the largest, if not the largest, growers of ground nuts in the Colony has appreciated this fact fully and always markets his nuts in this condition.

In conclusion, it may be said that the soil and climatic conditions of Rhodesia are essentially well suited to the production of ground nuts, and that this crop should form one of our staple agricultural products for export. To achieve this end, however, we must have better attention to growing and a very much higher average yield per acre, together with more perfect and cheaper facilities for placing the crop on the overseas market.

Merino Sheep in the Melsetter District.

RESULTS AT FAIRVIEW FARM.

By Messrs. Hanmer Bros. (Melsetter), Ltd.

The following notes have been written for the Journal by our request, for we thought it desirable that the experience of Messrs. Hanmer Bros. should be placed on record. Sheep are on their trial in Southern Rhodesia, and it is too early as yet to form any conclusion as to the prospects of establishing an industry here on any considerable scale. Some of the experiments conducted during the past few years have been unsuccessful, but this experience does not warrant the assumption that Southern Rhodesia is unsuitable for sheep. At Messrs. Hanmer Bros.' farm the conditions for rearing sheep appear to be very suitable, and it will be very interesting to see whether the encouraging results so far obtained will be confirmed later.—Ed., R.A.J.

A little over a year ago the writer arrived on the farm Fairview, in the mid-Melsetter district. The farm was bare of all improvements, so that after building a small house every effort has been expended in the construction of fences, sheep kraals, etc. Two hundred Merino ewes and five rams were brought in December, 1928, from the high veld of Natal. This country is similar to the Melsetter district as regards rainfall, altitude, pasture and climate, and was selected for

the purchase of the sheep so that they should experience the minimum change of conditions. These sheep trekked out from Umtali and landed on Fairview on 1st January, 1929. Up to that date rain had been scarce, but immediately on arrival they were subjected to the severest of conditions—continual rain or "guti" for three weeks without a break. A large shed had been built in which to house them temporarily at first, as owing to certain unavoidable circumstances the sheep could not be imported earlier, which, if it had been possible, of course would have been greatly to their advantage.

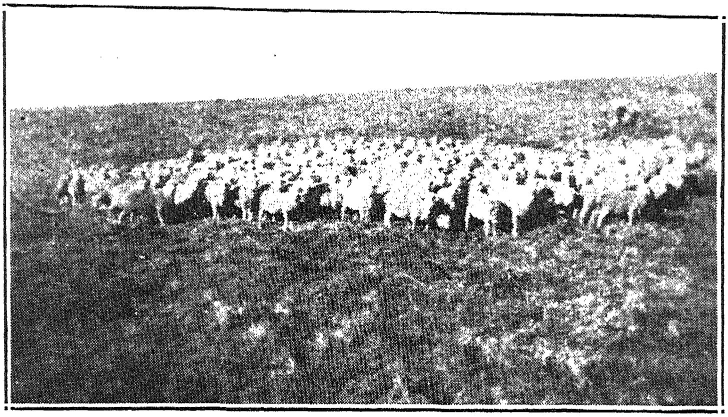
In February we had a fine spell, but March was decidedly bad. By the end of the wet season there had been 70 inches of rain. Through this period there was only one casualty from exposure—the remainder stood up to the change wonderfully.

Our method of protecting the sheep against vermin was that of constructing wire kraals in different parts of the farm. The kraals are 100 yards square, with 4 ft. wire netting strained by means of plain wire threaded in the top and bottom—the lower side is buried in the ground. Above this there are five strands of barbed wire 5 ins. apart, making the total height approximately 6 ft. This should be proof against all wild animals which are likely to appear. Inside the kraal grass shelters were built for protection to the ewes, and especially to the lambs when they arrived. The sheep boys always sleep inside the wire enclosure.

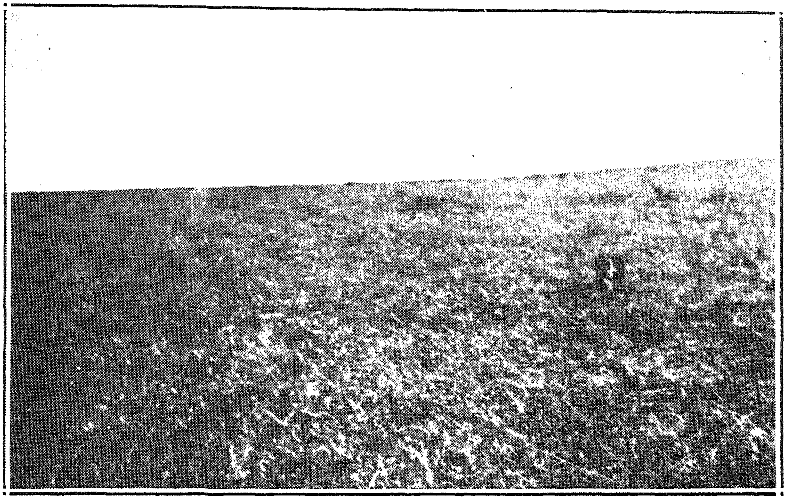
In May we imported another 300 ewes and 6 rams; these on arrival were in poor condition, but after a month of good grazing were in as good condition as the original flock. Since being on the farm all the sheep have had access to a salt and bone meal lick morning and night. This lick is placed in old railway sleepers which have had their lips knocked flat. Dosing against wire worm has been carried out regularly every three weeks, except to those ewes which were due to lamb in six weeks' time or less. In May the January arrivals started to lamb down. There never was any difficulty in the actual lambing, as might have been expected under the new conditions.

Again in September the second fall of lambs came with equally satisfactory results. Owing to this late fall of lambs

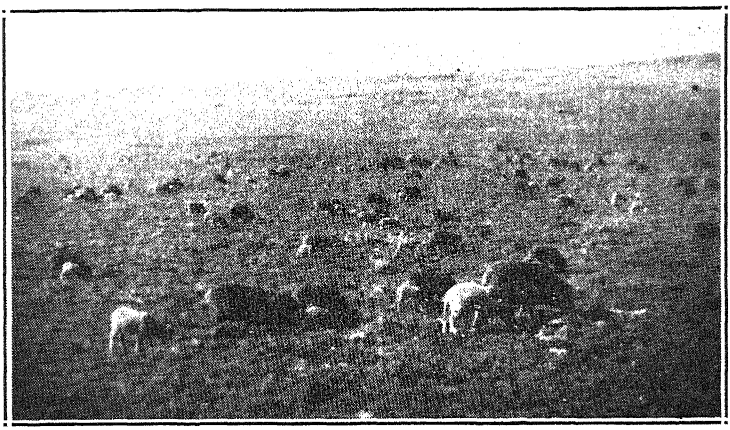
Sheep kraal with shelters, natives' hut and the homestead in the background, Fairview Farm, Melsetter.



Sheep farming at Fairview Farm, Melsetter; 300 ewes imported from Natal in May, 1929. Photograph taken 1st July, 1929.



Sheep farming at Fairview Farm, Melsetter, showing the length of two years' growth of grass; sheep dog lying down.



Ewes with lambs at foot, Fairview Farm, Melsetter.

we could not start shearing until the middle of October, but with the use of a Stewart shearing machine this operation was completed in a fortnight. Every care was taken to grade and keep the wool clean, a wooden floor having been temporarily laid down and a wire table on which to throw the fleeces erected in order to remove dirty pieces. The fleeces averaged out a shade over 8 lbs. each, and the only ones which showed a break in the staple were the ones which had had a touch of blue tongue. Since shearing, the whole flock, which now number 800, have been inoculated against blue tongue, with the exception of the smallest lambs.

The veld on these hills is mostly comprised of a short, stocky grass, which, if kept grazed, stools out into a beautiful turf. Care has been taken not to burn the grass in excess of requirements, so that after the first burning it should not be necessary to burn it again if kept sufficiently short by grazing.

The methods adopted now for the general welfare of the sheep are briefly: Plenty of vermin-proof night kraals in order to give change of veld and to prevent making the ground inside the kraal dirty, herding by day against attacks of wild dogs and the like, regular dosing against wire worm, yearly inoculation against blue tongue, adequate shelters, not by means of sheds, but by trees and grass shelters, and proper control of the grazing.

The rams were put into the flock again in the middle of November and will be taken out again in the middle of February. This will cause all lambs to fall between the middle of April and the middle of July. Later lambs do not stand the same chance during the rains as the early ones.

At the time of writing, the flock continues in the best of health and condition. The photographs were all taken at the beginning of July, 1929, which is the time when there is the greatest scarcity of grass.

Forestry in Southern Rhodesia.

THE UTILISATION OF WOOD.

PRESERVATION OF RHODESIAN TIMBERS.

By T. L. Wilkinson, M.Sc., B.Sc.F.,
Assistant Forest Officer.

Timber preservation, which is quite distinct from seasoning, is a process by which timber is protected from damage and destruction by various causes, such as decay, insect attack, etc. It is usually carried out on seasoned wood.

Wood, in common with all other vegetable and animal substances, when divested of life is liable to decay. All woods are not equally affected, some being more liable than others. This tendency to decay can be prevented and retarded by treating the timber with some mechanical process, or, better still, with some chemical solution, which renders the timber toxic and unpalatable to timber-destroying agencies.

Timber preservation has an important economic bearing on the world's timber supplies, since not only does it help to conserve the resources by increasing the durability of timbers, but it also makes possible the use of less durable timbers which, untreated, could not be used, and the use of thinnings which are produced in the ordinary course of forest management.

The very desirable properties of durability and resistance to insect attack are more often absent than present in Rhodesian timbers. Practically all of them have sapwood, which is liable to attack, though a number have heartwood, which is resistant to a greater or lesser degree.

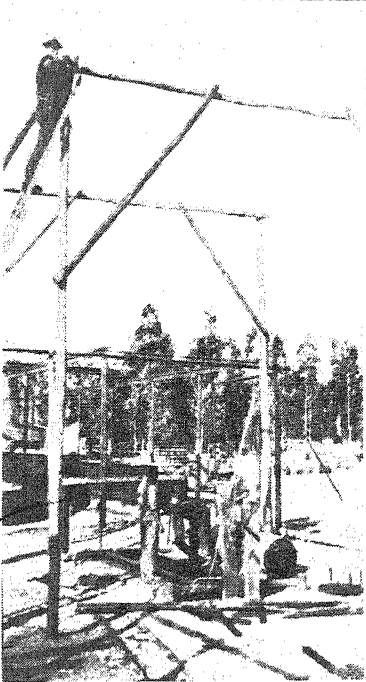


FIG. II

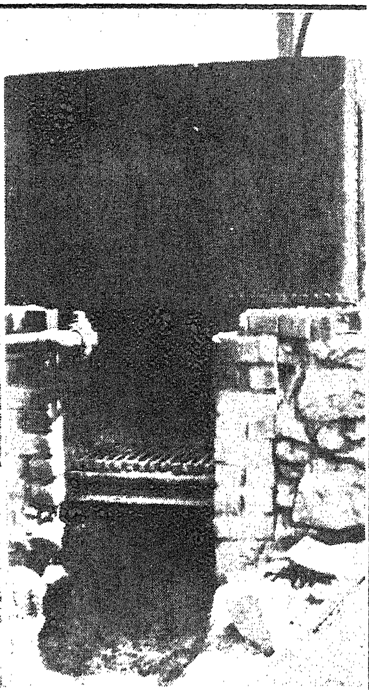


FIG. III

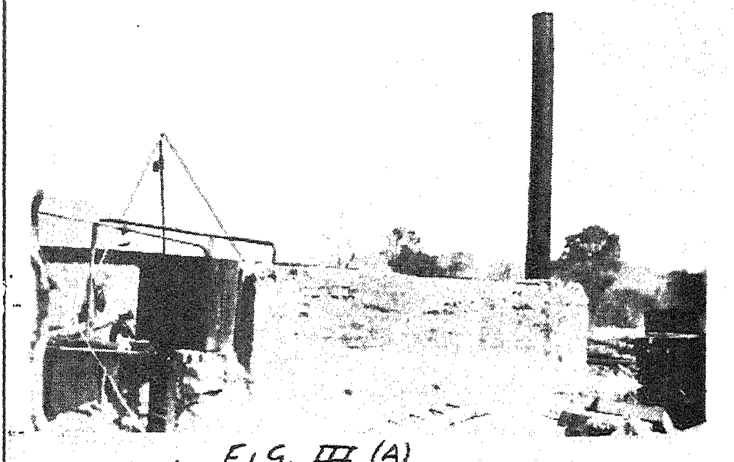


FIG. III (A)

Fig. II.—Commercial butt-treating plant, with trough type tanks in the background.

Fig. III.—Showing method of heating tank illustrated in Fig. III. (a).

Fig. III. (a).—Small direct firing trough type plant, costing £10 15s.

Most of the introduced conifers (pines, cypresses, etc.) and eucalypts (gums) are not durable in their youth, due to the high percentage of sapwood which they contain.

If reasonable durability and resistance to insect and fungi attack can be assured, then small dimension thinnings and non-durable timbers become economically utilisable.

This assurance can be given by using correct preservative treatments suited to the species and to the work on which the timber is to be employed.

Wood-Destroying Agencies.—The chief wood-destroying agencies are fungi, termites and wood-boring insects.

Fungi are low forms of plant life which cause decay or rot in timber. Decomposition which takes place when wood is affected by fungi causes the wood to lose its rigid structure, finally crumbling to a powder under the slightest shock. Fungi only live in moist wood; activity ceases in very wet or dry wood, e.g., wood submerged in water remains sound for long periods, while thoroughly seasoned wood as used in furniture is not usually subject to attack by fungi. Exposed wood, or wood in contact with the ground which is moist, is more readily attacked than protected wood. Thus posts are most readily attacked at ground level. The climatic conditions of any locality play a large part in the behaviour of fungi. In warm, humid localities, for instance, fungi are far more active than in cold and dry areas. It is for this reason that in this Colony they are so much more active in the summer.

Termites, or white ants, as they are erroneously termed, are too well known in Rhodesia to require description. Wood is one of their principal foods. Termites literally tear the wood into pieces, continually removing small particles and thus destroying the wood.

Wood borers of the "powder post" and "pinhole" type are small beetles which lay their eggs in cracks or holes of very small dimensions made by them in the surface of the wood. When the larvæ hatch out they work backwards and forwards in the wood, reducing it to a powder. The adult beetles emerge after pupation from the holes and depart to attack fresh wood.

Other agents which are responsible for destruction of timber to a lesser extent are marine borers (*Teredo navalis*),

fire, mechanical abrasion, alkaline soils, birds (woodpeckers, etc.), sap stain.

History of Preservative Treatment.—The preservative treatment of wood dates back to the early Egyptians, who excluded moisture from wood and coated the wood with natrum and bitumen.

The Romans and Greeks made their poles more durable by placing stones around the butts, thus permitting free access of air to the parts most liable to rot. They also rubbed into the wood or placed in holes bored in it oil of cedar, juniper or olives. Another method they used which is still in vogue was to char the outside. An impetus was given to preservation in the early eighteenth century, when it became necessary to prevent decay in English warships and dykes in Holland. In 1705 Homburg first used mercuric chloride as a preservative, but it was not until de Boisseau had improved this method in 1767 and Kyan had further improved it in 1832 that it was patented. Other early methods were established by Bordinere and de Boisseau in 1764-67, using copper sulphate later in 1837, patented by Margary. It was not until 1815 that zinc chloride, the most widely used water-borne preservative of to-day, was introduced by Wade and later in 1837 improved by Boucherie, being patented by Burnett in 1838. Coal tar oils (creosote, etc.) were first used by Moll in Germany in 1836, but were not patented till 1838 by Bethell.

Many further preservatives and modified methods have been tried since those early days, but the old methods and preservatives still hold, creosote being the most widely used preservative of to-day. Until the time of Tyndall and Pasteur, it was thought that decay was due to some property of moist air. These two workers showed it to be due to bacteria and fungi. The most recent developments have shown that di-nitrophenols, fluorides and arsenical compounds, especially zinc meta-arsenite, are the best preservatives beyond those previously mentioned. Work is now being carried out on emulsions of salts and oils in order to obtain a more stable preservative.

Though wood preservation is a recognised large scale industry in practically all civilised countries, but little has been done in Rhodesia, where there is a great need for it,

due to the activity of fungi, termites and borers. The structure of wood, which is dependent on many factors, not only affects the durability, but also the penetration into and distribution of preservative solutions. Fortunately the less durable woods are as a rule light and open grained, and are in consequence more readily treated.

Preparation of Wood for Preservative Treatment.—Seasoning, except in certain special circumstances, is a necessary preliminary adjunct to preservative treatment. Late summer felling will probably be the best aid to seasoning with a minimum of cracking and checking. Timber felled during this season or at any other time of the year must be stripped clean of all bark prior to treatment. To reduce insect and fungi attack, barking is best done immediately after felling. Soaking timber in water for a prolonged period neither seasons it nor improves the penetration of solution on treatment.

Prolonging the Life of Timber without Preservatives.—

Peeling or Barking increases the durability of posts, poles, etc. Bark holds up moisture and makes conditions favourable to decay. It also harbours wood-boring insects.

Seasoning lengthens the life of timber, except when after seasoning it is kept in contact with moisture, e.g., sleepers, posts, etc., in contact with the ground.

Charring is one of the oldest methods practised and usually gives good results, considerably prolonging the life of timber.

Whitewash and Paints are only effective so long as they completely cover the timber. They are of more use on unexposed wood than on poles, posts, etc.

Loose Stones piled around the base of poles and posts tend to keep the areas free from weeds and to permit free circulation of air around the parts most liable to decay. The labour involved, however, is not justified by the results obtained.

Setting posts in concrete cannot be depended on to prevent decay, and in any case is too costly for general consideration.

Prolonging the Life of Timber by Means of Preservatives.—In his bulletin, "The Present Status of Timber

Preservation in South Africa," English gives the following ten important requirements for a preservative for general use. It should be—

(1) highly toxic to all wood-destroying agencies, with a desirable factor of repellence included;
(2) cheap;
(3) suitable for use in iron treating equipment, i.e., non-corrosive;
(4) insoluble in water in the form in which it finally remains in the wood;
(5) soluble in weak organic acids to give physiological effect to its toxicity;
(6) non-volatile at ordinary temperatures;
(7) such that it does not change the natural clean appearance of the timber;
(8) such that it exerts some retardance on the absorption and loss of water and water-vapour by the wood;
(9) such that it does not increase the electrical conductivity of wood;
(10) such that it decreases or does not increase the inflammability of the wood.

Numbers (1), (5) and (8) are preservative factors.

Numbers (4) and (6) are permanence factors.

Numbers (2) and (3) are economic factors, while (7) is a refinement factor not applicable in preserving timbers for rough use.

Most (water-borne) inorganic preservatives fail in (4), (8) and (9).

The following preservatives are likely to find the widest use in Rhodesia:—

(1) *Arsenious Oxide.*—This salt, which is sold as a white powder and used as a 1 to 2½ per cent. solution in water, is highly poisonous and in consequence must be handled with care and only used where there is no chance of it contaminating food. Its widest use will be in treating sleepers, posts, poles, unexposed constructional timber, etc. It is highly toxic to all timber-destroying agencies while it remains in the timber, but it is inclined to leach out in a few years when used in timber exposed to the weather.

(2) *Sodium Arsenite* may be used instead of arsenious oxide, to which it is very similar. These two salts cost 3d. to 4d. per pound in Southern Rhodesia, and since half a pound of dry salt per cubic foot of timber is adequate for all purposes, these salts are one of the cheapest preservatives in use.

(3) *Sodium Fluoride* is a white powder which, dissolved in water to make a 2 to 4 per cent. solution, is very effective as a fungicide. It is moderately poisonous, but leaches out readily when exposed to the weather. It costs approximately the same as zinc chloride and arsenious oxide and has no advantages over them. Its chief use will be as a constituent part of "Wolman Salts" or similar proprietary preservatives.

(4) *Zinc Chloride* is usually sold in a solid form which becomes liquid on exposure, due to the deliquescent nature of the salt. It is best injected into the wood in a 2 to 5 per cent. solution. Zinc chloride costs 3d. to 4d. per pound in Rhodesia and consequently may be widely used. It is readily soluble in water, and for this reason leaches out rapidly when used on timber exposed to the weather. Its widest application will therefore be for interior work or for timber not exposed to the weather. Used in combination with arsenic, it forms a good preservative, e.g., a solution of 4 per cent. zinc chloride and 5 per cent. arsenious oxide.

(5) *Zinc Meta - Arsenite* is undoubtedly the nearest approach yet obtained to the perfect preservative. Its high cost is the only drawback against its more extensive use.

(6) *Creosote* is the most universally used preservative, but its cost prohibits its use to a large extent in this Colony. It is very effective, being both toxic and repellent. Its widest use will be in situations exposed to the weather, since the oil may drip or spoil adjacent materials if used for interior work.

(7) *Petroleum Oil* may find use as a substitute for creosote, either pure as a mixture with naphthalene, carbolic acid, etc., or used as a mixture with creosote to cheapen costs. Its widest use will, however, probably be as a subsequent treatment for poles, posts, piles, etc., after treatment with a water-borne preservative. Petroleum oil retards leaching of these salts and adds repellent properties to the toxic properties of the water-borne preservatives.

(8) *Tar* is not recommended for general farm use, but may find wide use as a subsequent treatment for sleepers treated with a water-borne salt to retard leaching.

(9) *Wolman Salts,* which are widely used in Europe, combine several well known preservative salts. In "Thanalith," which is prepared for use in tropical countries, a fixing agent is included to retard leaching of the toxic salts. These salts are used as a 2 per cent. water solution and cost 1s. 6d. per pound, about a quarter of a pound being the requisite amount of salt per cubic foot of timber treated.

In addition to the above, there are a number of other chemicals and proprietary articles too numerous to mention, since their use will be limited in Rhodesia, either on account of their cost or unsuitability except for special purposes.

Data which will be given in further articles on "Utilisation of Wood" will show how these preservatives greatly increase the life of timber and how great an economy their use is.

The above preservatives may be used either hot or cold and in one of the following ways:—

(1) Superficial or brush treatment.

(2) Open tank treatment.

(3) Closed tank or cylinder treatment, in which pressure is usually applied.

(4) Paste injection treatment.

These four general methods include practically all the patented processes which are as a rule only modifications of the above.

It is not proposed to deal with treatments here other than those recommended for use in Rhodesia.

Brush Treatment.—In this a preservative, usually oil (i.e., creosote, carbolineum, solignum, petroleum oil, etc.), is applied either hot or cold to the surface of the wood. It is obvious that this method cannot be as effective as any injection method.

Open Tank Treatment.—Tanks to contain the preservative solution may vary considerably in size and shape, but the two main types in use are:—

(1) The drum or deep type, used mainly for butt-treating poles, posts, etc.
(2) Trough (horizontal) type, used for total immersion of any type of timber.

Whatever the type of tank, its chief requirements are the same, viz.:—

(a) It shall be strong enough to hold the weight of the preservative and timber.
(b) It shall not leak.
(c) Be readily heated.

Any metal tank which will satisfy these requirements will do. Wooden tanks and barrels, unless lined with metal, are useless, since too much preservative will leak from them when heated, and cement tanks are far less economical than iron tanks.

All these plants may be heated by direct firing, by indirect heating or by steam coils. The timber may undergo simple immersion in cold liquid (for this a dip tank with strengthened dip or one of the above-mentioned solutions may be used), which is usually not very effective and is rather a lengthy process if any results are to be obtained.

If the liquid is heated, however, the air in the wood expands and is forced out. On cooling, the liquid enters the wood under atmospheric pressure. In this case the hot period may vary from one to three hours at 180°-200° F., and the cooling period will of course depend on the size of and conditions under which the tank is operated. The overall time of treatments will vary from six to eighteen hours. This includes filling and emptying the tank, etc. The absorption of liquid takes place almost entirely during the period of cooling. As an alternative to cooling in the hot tank, two or more tanks may be used, one containing the hot solution and the other or others containing cold solution. When the heating period (one to three hours) is completed the timber is removed immediately and re-immersed in the cold tank and left to soak for from one to five hours, depending on the species and dimensions of the timber.

The drum type of open tank may vary in capacity from a simple 80-gallon drum for butt-treating posts to a large upright tank in which large quantities of poles, posts, etc., may be treated.

Figure 1 shows the smallest and most simple type of plant well suited for use on the farm. This is fitted with a false bottom to prevent the timber from floating. The bottom can be made from the head cut out of the drum or any flat piece of iron with strips of iron screwed on, the screws protruding from half to three-quarters of an inch. A larger plant of this type which can be made portable or stationary and be shared by a group of farmers is very suitable.

The trough type of plant may vary in size, rigidity of construction, etc., according to the timber to be treated.

Figure 3 shows a small plant with direct firing, costing from £10 to £15.

Figure 4 shows a simple plant if steam is available for heating.

Much economy of time, effort and material is secured by the use of a long open tank, in which complete posts, poles, etc., can be immersed. Where no steam is available for heating the tank, it should be constructed of iron plate. Less rigid materials may be used if steam coils are used to supply the heat.

The handling of timber is greatly facilitated by the provision of some form of overhead gear, whereby posts, timber, etc., may be loaded and unloaded in cages into the tank. This matter is best left to the ingenuity of the operator. A handy arrangement for handling small quantities of timber consists of a number of wire ropes. One end of each rope is attached to one side or other of the tank, the other end remaining free. By laying these wires across the tank the timber may be raised or lowered at will. In a similar manner a number of straps or weights are required to keep the wood below the surface of the preservative. Unless covers are provided, the tank should be deep and narrow rather than shallow and wide. An adequate drainage platform economises the use of the preservative. A portable plant operated on the co-operative principle by a number of farmers appears to be the most economical equipment for this work.

An 18-foot tank similar to those shown in Figure 4 should cost approximately £50. Suitable substitutes will naturally suggest themselves to the farmer. Old boilers, water troughs, hydraulic piping and other such articles have

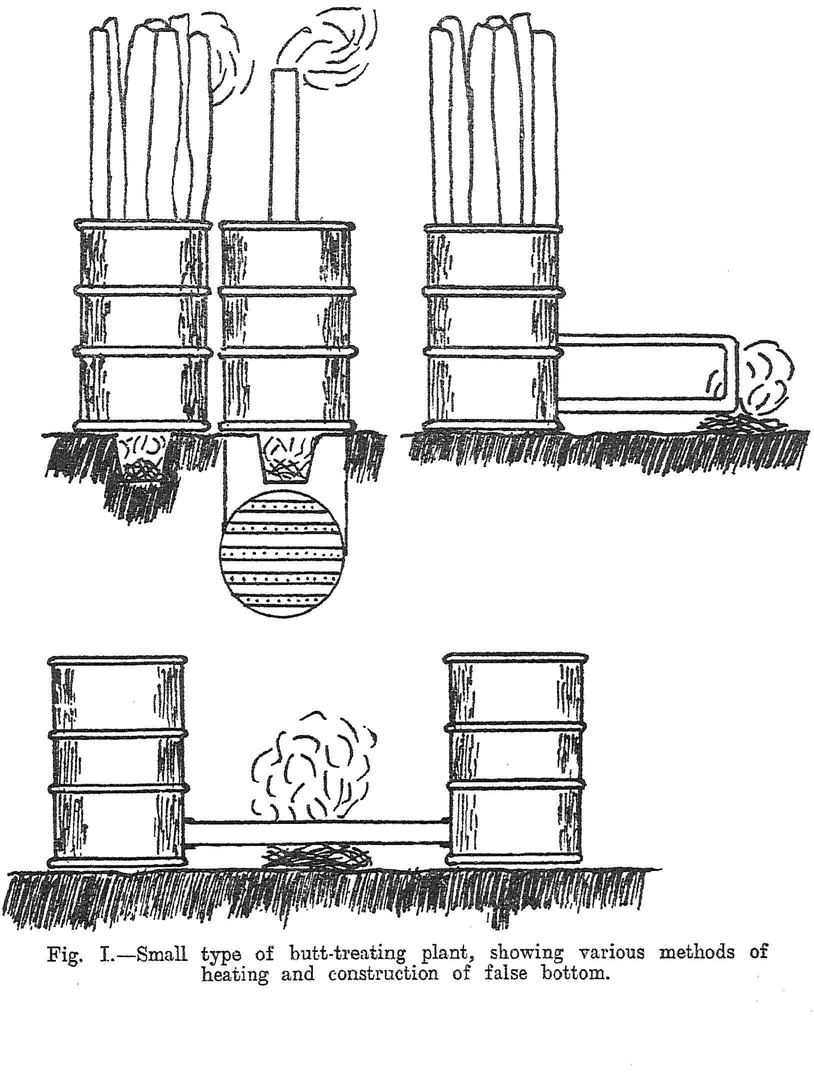


Fig. I.—Small type of butt-treating plant, showing various methods of heating and construction of false bottom.

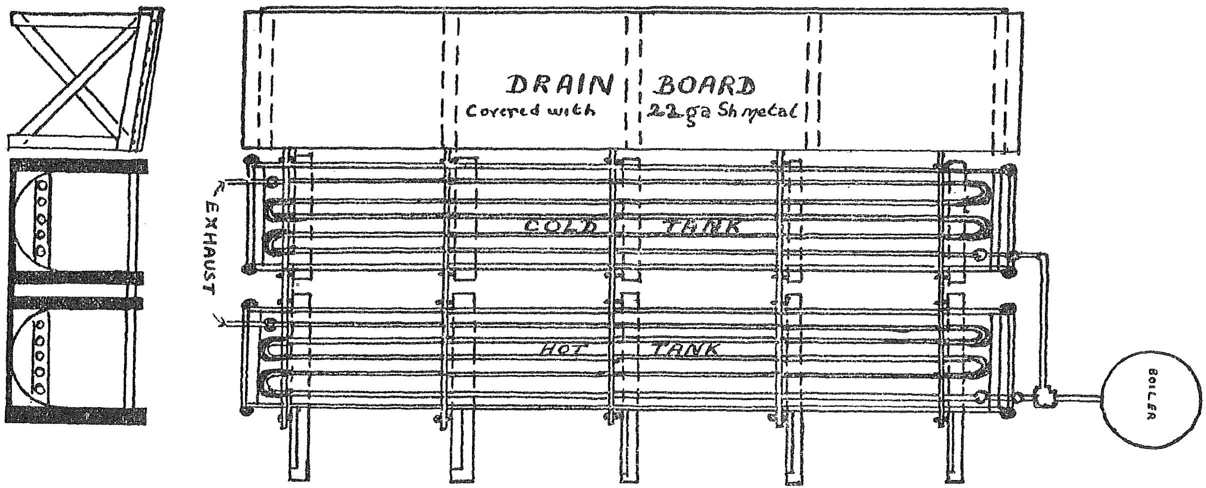


Fig. IV.—Trough type of plant, with steam heating. Only one tank is required if timber is left to cool in hot tank. The tank may be rectangular or trough-shaped in section.

been used. Plans and specifications for commercial plant of this type can be obtained from the Forest Office. Such a plant will cost £150 to £200 or more, according to size, exclusive of yard equipment, boiler for steam supply and overhead crane, etc.

The summarised procedure for the general operation of open tanks is, therefore:—

(1) Load the tank with timber, leaving sufficient room for solution (1 gallon of oil or solution containing ½ lb. of dry preservative per cubic foot of timber).

(2) Weight the timber or fix it in place; run in the solution.

(3) (a) If a single tank is used, heat to 180°-200° F. for from 1 to 3 hours, then allow to cool for 3 to 4 hours if oil, or to 110°-120° F. if water-borne preservative. (b) If two or more tanks are used, one hot, one (or more) cold, heat to 180°-200° F. for from 1 to 3 hours, then remove and immediately re-immerse in cold tank for 1 to 5 hours.

(4) Remove and open stack to dry.

More detailed procedure will be given later in articles on timbers for farm buildings, timbers for fencing, timbers for sleepers.

When large quantities of timber are to be treated a closed cylinder or pressure plant is employed. In this type of plant air is removed from the timber mechanically by a vacuum pump. Such plants are usually costly (£1,500 being the cost of a minimum economic unit plant), but they have the advantage of being able to treat the timber much more rapidly. Details of plant and accessories, with costs and method of operation, are available if desired at the Forest Office, Salisbury.

A recently introduced method with possible extensive use is the paste injection method (cobra process). In this a special instrument, consisting of a cylinder for holding the paste and a hollow needle having two orifices near the point, is provided. The needle is inserted into the wood and the toxic paste forced into the wood through the needle. The paste dissolves in the sap and is evenly distributed throughout the wood after a few months. It is only

applicable to green material or timber standing in wet ground. The holes formed by the needle should be filled with paste, and a brush treatment of creosote is beneficial.

Care of Treated Material.—The effectiveness of any of the methods of treatment which have been described is dependent upon keeping an unbroken layer of treated wood over the entire treated surface. Care should be exercised in handling treated timber, so that the treated wood is not scraped away or otherwise injured and untreated wood thereby exposed. Treated timber should never be cut if it can be avoided. All sawing, etc., should be done, if possible, before treatment.

If it is necessary to work the timber after treatment, the exposed untreated wood should be brush-treated with several applications of preservative before it is put in place. If butt-treated timber or other timbers of which only part is treated are not to be used for some time, they should be open piled and raised off the ground. If treated otherwise, they will be open to attack in the untreated wood. Treated timber when stored should always be raised off the ground. Posts, poles, etc., set in the ground should have at least six inches and preferably one foot or more of treated length showing above the ground.

Costs and Value of Treatments.—Once the initial costs of plant, equipment, etc., have been overcome—and these are not high—the main item of cost is the preservative. The average range of prices in the main Rhodesian centres for the principal preservatives purchased in bulk is as follows:—

Creosote: 2s. 3d. to 3s. per gallon.
Zinc chloride: 4d. per lb.
Arsenious oxide: 3d. to 3½d. per lb.
Sodium arsenite: 4d. to 5d. per lb.
Sodium fluoride: 4d. to 5d. per lb.
Crude oil: 1s. to 1s. 6d. per gallon.
Wolman salts: 1s. 6d. to 2s. per lb.

Freight charges to outside districts make the costs somewhat higher.

The cost of applying the preservative is difficult to estimate, owing to varying costs of labour, fuel, etc., but it should never exceed 3d. per cubic foot.

The average absorption aimed at should be not less than 10 lbs. (1 gallon) of oil or creosote per cubic foot, and not

less than ½ lb. per cubic foot of any of the water-borne salts except Wolman salts, where a quarter of a pound should be aimed at. Thus for water-borne preservatives the cost should vary from 2d. to 3d. per cubic foot.

The fundamental problem of economics is that of investment, and in choosing between treated and untreated material an analysis of the relative investment costs, based on compound interest calculations, is necessary if sound judgment is to prevail. Comparisons are best made on the basis of annual service charges, which are determined by the sinking fund method.

These annual charges represent the equal annual payments which at annual compound interest will provide for renewal at the end of the life of the timber without any scrap value for the timber.

They are determined by the formula:—

$$\frac{C\,R\,(1+R)^n}{(1+R)^n - 1}$$

Where C = final cost of timber in place,
R = rate of interest (5 per cent. = 0.05)
n = life of timber in years.

The following table has been compiled for this formula to show the annual service charges on a piece of timber costing 1s. set in place, with interest at 5 per cent. The table may be applied to give annual service charges on timber of other values by simple multiplication.

Annual Service Charges on Timber costing 1s. in place.

Interest at 5 per cent.; Computed from Formula above.

Life in years.	Annual cost.	Life in years.	Annual cost.	Life in years.	Annual cost.
1	1.050	11	0.121	21	0.078
2	0.530	12	0.113	22	0.076
3	0.367	13	0.107	23	0.074
4	0.282	14	0.101	24	0.073
5	0.231	15	0.097	25	0.071
6	0.197	16	0.092	26	0.070
7	0.173	17	0.089	27	0.069
8	0.155	18	0.086	28	0.067
9	0.141	19	0.083	29	0.066
10	0.130	20	0.080	30	0.065

Example.—Annual service charge of a post costing 1s. 9d. treated, plus 6d. for setting in place, having an estimated life of 10 years is (from table) 0.130 × 2/3 or 0.130 × 2.25 = 0.292/- = 3½d.

By estimating the initial costs and lives of the treated and untreated posts and determining their annual service charges, a fair approximation of the economics of the problem may be obtained.

Example.—To ascertain whether the use of a treated or untreated *Eucalyptus saligna* post is cheaper.

Life of untreated post, 2 years.
Life of treated post, 6 years.

	Untreated.	Treated.
	s. d.	s. d.
Cost of post	0 6	0 6
Cost of treatment	—	0 6
Cost of setting, etc.	0 6	0 6
Total cost	1 0	1 6
Life	2 years.	6 years.
	0.504 × 1	0.197 × 1.5
	0.504s.	0.295s.

The treated post is decidedly cheaper.

Or to ascertain whether a treated msasa (*Bracystegia randii*) post costing 3d. is cheaper to use than a mwanga (*Ormosia angolensis*) post costing 2s., the former having a life of 5 years and the latter a life of 15 years.

	Msasa.	Mwanga.
	s. d.	s. d.
Cost of post	0 3	2 0
Cost of treatment	0 3	—
Cost of setting, etc.	0 6	0 6
Total cost	1 0	2 6
Life	5 years.	15 years.
	0.231 × 1	0.097 × 2.5
Annual service charges	0.281s.	0.242s.

The treated msasa (*Bracystegia randii*) is cheaper to use.

It is hoped that this article will assist in some measure to lessen the wasteful and uneconomic use of timber which prevails at present, and render a service by indicating the savings in labour and costs which can be effected by using properly treated timber.

The Poultry Industry in Southern Rhodesia.

TALKS TO BREEDERS.

THE NORMAL AND PULLET MOULT.

By H. G. Wheeldon, Chief Poultry Officer.

The Normal Moult.—The natural season for poultry to moult—fowls, turkeys and waterfowl—is during the months of January, February and March. It is during this period that the majority of the moulting birds do not lay. As long as a hen lays regularly she usually retains her old feathers for some time, but if for any reason other than sickness or debility or broodiness she stops laying, the feathers begin to drop out and she is then said to be moulting.

The order in which the feathers drop out is first from the head and neck, then the back, wings and body. The "neck or partial" moult may be noticed at any season of the year, even in good layers, but if the moult progresses to the back the primary feathers of the wings generally drop out, which is followed by a complete moult. This stage is seldom reached out of season unless the hens have for some reason had a setback and entirely stopped laying, or in other words, the cessation of laying is likely to bring on moulting. Normally, when the old feathers drop out new ones grow to take their place. Poultry seldom lay when the new feathers are growing, but exceptional individuals with good vitality are occasionally found which do lay during this period. Generally speaking, fowls which are kept in full lay will delay in the casting of their feathers, and in this way many of the best layers may carry a large proportion of their old plumage beyond the normal season into the winter, and then moult. It is therefore obvious, the later a hen moults

in the autumn or winter, the longer will be her laying season, and hence the greater will be her production.

Many poultry keepers cull the early moulters, believing —and not without reason—that they are less profitable than birds that continue producing well into the autumn or winter; but on this subject we cannot lay down hard and fast rules. The period at which a bird moults is a *good guide* in culling, but only when it is considered with other factors which may be termed correlative. To cull at the period at which a bird moults, irrespective of the other factors, would mean that in some seasons it would be necessary to cull the whole flock. The date of hatching does not denote any definite month of moulting. One cannot say definitely that any special system will give definite results, as one may be successful with a certain system for several seasons, but invariably will come the time when all calculations and systems come to nought. This applies particularly to the prevention of the "pullet moult" and the forcing of an early moult in the old stock before the normal season. Hot, dry weather seems to check production and to hasten the moult.

The question as to how long fowls take to moult depends largely upon the atmospheric conditions, age and the treatment given to the birds during this trying period. Normally birds should not take longer than three months completely to grow their new feathers from the time they commence to moult. Old birds take longer than young birds to grow their new feathers and recommence laying, and they require special care to hasten them through. This applies particularly to the old breeding stock of the heavy varieties, such as Wyandottes, Rhode Island Reds, Sussex, Orpingtons and Plymouth Rocks, which may be required for the forthcoming breeding season. The birds to be retained in the laying flock for another season should also be given some attention to hasten them through, so that they will recommence laying as soon as possible to meet the demand for eggs, which usually fetch a high price at this time of the year.

The moult will be general during this and the next few months, and it will be found advantageous, in dealing with the moulting birds, to have two pens set aside for placing therein all the hens that require attention, and as the moult

progresses to move them from No. 1 to No. 2 pen. These pens should be shady and roomy.

Having got the pens ready—that is, clean and well littered—proceed as follows: Remove all the hens as they stop laying to pen No. 1. These birds must be kept in lean condition by encouraging as much scratching exercise as possible and supplying them with grain food only—roughly about 1½ to 2 ozs. of this per bird daily. Cut out all mash foods from their daily rations. Grit, charcoal and oyster shell must be kept before them. Feed green food in abundance, and see that they have all the fresh water necessary for drinking. Once a week, on fine days, put a little Epsom Salts in their drinking water to make it slightly saline to the taste. Within a month of this treatment the feathers should fall out freely. When this is noticed, examine the birds regularly, and those that have cast feathers and those that have the most new young feathers just showing must be removed to pen No. 2. The birds in No. 2 pen require different treatment from those in No. 1 pen, and this is the reason for their being placed in a different pen. As the birds are removed to No. 2 pen see that they are free from insect vermin, and if these are troublesome, dust the birds well with insect powder, taking great care not to injure the young growing feathers.

The treatment of these birds should be with a view to assisting the growth of the new feathers and building up their condition. They should be gradually brought back to the mash diet, to which may be added a little sulphur. A wet mash occasionally mixed with stewed linseed would also be beneficial to the birds at this stage. Take 1½ tablespoonfuls whole linseed and stew to a jelly in a pint of water, and mix this to a crumbly consistency with bran. Give this once a day at the rate of about 1 dessertspoonful to each bird. Give green food in abundance, and grit, charcoal and oyster shell and fresh clean water daily. Add Douglas mixture to the drinking water two or three times a week, the dose being 1 dessertspoonful to each quart of water.

The grain mixture should be given in the evening covered in litter to induce exercise. Sunflower seed or linseed are valuable additions to the grain mixture for moulting birds.

As the birds become well feathered they should be removed to the breeding or laying pens and allowed to settle down to their permanent quarters as they come on to lay.

The Pullet Moult.—This may be termed a "premature moult," which, in conjunction with the "normal moult," has a very important bearing on the egg output. It is during the next few months—the natural season for poultry to moult—that a marked shortage of eggs is experienced, and it is during this season of the year that our limitations are brought home to us. Although a shortage of eggs is experienced in the Colony as a whole, there is no doubt that there are successful individual poultry keepers whose production is not very seriously curtailed during this period, and it is only when the successful men make the majority that the annual shortage will become less acute, because the experienced poultry keeper raises pullets successfully to take the place of the moulting birds. The whole question seems to be based on experience and the systematic, businesslike running of the plant. The extent to which anyone can take advantage of this period depends upon the ability to raise fresh stock each year to replace a proportion of the previous season's stock, and having raised the young stock, to prevent them, during some seasons more than others, from going into a premature moult. In this connection readers should be reminded that the "cockerels" very seldom, if ever, fall into a premature moult, but if they are exposed to adverse conditions this may cause a partial or neck moult among the very early hatched cockerels. That the pullets are more susceptible no one will deny, and this may be accountable first to the highly developed nervous system of productive birds, which in turn is more sensitive to the environmental conditions and other influences.

It will be noticed that tame, friendly, high-producing pullets are less likely to be affected than nervous or timid birds which are producing heavily. Having, therefore, hatched the pullets at the proper time, and having provided them with comfortable environmental conditions, proper nutrition and a regular system of routine, it might be assumed that the pullets ought to behave satisfactorily so long as there be no untoward disturbance which will affect the nervous system, such as a fright or disturbance caused

by dogs or wild vermin, or the birds are unsettled by being moved from one house or locality to another. Rough handling by the attendant or any abrupt change in the feeding (nutrition) also has an important influence on the nervous system, as will exposure to rain or any other adverse weather conditions. It will naturally be concluded that the *nervous system* deserves some consideration in the matter of the "pullet moult," which successful men who study the requirements of the birds are able to deal with effectually. Similar examples may be recalled in other classes of productive stock when the production may be affected; those who are familiar with the highly productive milch cow have no doubt noticed a decreased yield in the milk when the regular milker is changed, as will irregularity in milking, rough handling or other disturbances affecting the nervous system. The regular gains in weight in fattening stock and the retarded growth or a weak spot in the staple of the wool in Merino sheep are also attributed to disturbances as outlined above.

It is not unusual to find a small percentage of the first or early hatched pullets developing more quickly than the bulk of the early hatched stock, but this cannot be avoided during warm seasons, and fortunately it has never any very serious consequences, even if these birds do moult. Early hatched pullets have been known to lay consistently without falling into a pullet moult, and the same season later hatched birds from the same strain have moulted; and although it seems difficult entirely to eradicate the moulting tendency altogether in every flock of layers, careful management would certainly minimise it, even if the moult is to some extent hereditary. It is generally supposed by many poultry keepers that the cessation of laying is the immediate result of a premature moult, but careful observation will show that in most cases the reverse will be the case.

Points to be considered in minimising the "pullet moult" may be summarised in the following:—

Suitable Houses.—Within the limits of the walls of the houses lies one of the important secrets in the successful prevention of the pullets' moult; not only must adequate space be provided but proper ventilation, and also the roof must be weather-proof. A hard floor well littered is

recommended, and cleanliness is a *sine qua non*. The aspect of the houses should be north, north-west or north-east in Rhodesia, and shelter and shade should be provided.

Maintaining Health.—For the best results it is necessary to keep the birds confined during the rainy season, but they must be given plenty of scratching exercise to keep them healthy by working for the grain feed. The feed can be raked into the litter once or twice a day, which will keep the birds contented and well occupied for several hours. Confinement is likely to give better protection and will avoid having to drive the birds into the houses when it rains. In addition to the grain food it is necessary to give a laying mash of good quality; the mash must be nourishing to provide for both production and development; special attention in this respect will be well repaid. Most of the pullets will develop better, continue to lay and avoid moulting if handled carefully with a view to keeping them contented, busy and undisturbed and free from insect vermin.

Nutrition.—Laying birds require plenty of good, wholesome food. The pullet moult may in no small measure be attributed to a lack of proper nutrition. As pointed out, it is probable that if the pullets are kept laying steadily they will not moult—or if they do, it will only be a slight neck or partial moult. If the pullets stop laying during the normal moulting season of the old stock, they are almost sure to pass through a complete moult. Unless pullets which are early hatched receive suitable treatment, they will not be able to find the energy to provide for both production and development. Production may cease if there is something lacking in the management. It is necessary, therefore, to perfect the management and environmental conditions as much as possible to prevent or minimise the pullet moult.

Sunn Hemp.

A FARMER'S EXPERIENCE.

The following valuable report by a farmer in the Ayrshire-Sipolilo district is published as being of general interest, demonstrating as it does, once again, how Sunn hemp will flourish under a great diversity of conditions of soil and treatment in this Colony, and how it can be utilised as a catch crop on virgin soil ready for planting too late in the season (the Sunn hemp was sown on the 22nd to 26th January) to allow of any of our main crops being grown with equal success. The Sunn hemp grown for seed was planted in rows 18 in. apart at a seeding rate of about 27 lbs. per acre, and was reaped on the 29th July to 6th of August.

At the present price of Sunn hemp seed, an excellent way of securing a good cash return from virgin lands in the first season, particularly where they are ready for planting so late in the season, is illustrated.

Although yields of maize from virgin red soil as high as 15 bags an acre, with a dressing of about 150 to 200 lbs. of phosphatic fertiliser per acre, are sometimes obtained, this is exceptional. It is very unlikely that a gross return as high as £7 10s. per acre would be obtained from maize, ground nuts or any of our other cash crops, on virgin soil and without fertiliser, even if they were planted at the optimum date, and certainly not when planted at the end of January.

In connection with the question raised in the report as to the advisability of ploughing under Sunn hemp as a green manure on virgin lands, it may perhaps be pertinent to mention here that a prominent grower of wheat under irrigation ploughed under a crop of Sunn hemp which received a heavy dressing (600 lbs. per acre) of basic slag, on virgin red soil last summer (1928), and grew what is probably

a record crop of wheat for Rhodesia, namely, over 14 bags per acre, on this land, during the following winter.

The practice of green manuring virgin soil cannot be unreservedly recommended, as the data concerning it are very meagre, but where the soil is not ready for planting before the end of January it may well prove the best policy to pursue on average soils in this Colony, and particularly on the lighter soils, which are known to be very lacking in humus and nitrogen. Each case must be considered on its own merits, as many factors must be considered, amongst others the desirability of obtaining some cash return from the land in the first year.

S. D. T.

The Value of Sunn Hemp.—"When Mr. ——— called he spoke so highly of this legume as a green manure that after he left I bought five bags of seed and sowed it partly by hand and partly by machine on virgin lands (ploughed for the first time and disc-harrowed during January and early February). I sowed altogether 38 acres and ploughed in 29 of them, saving nine acres for seed.

"These nine acres were reaped and stooked at the end of July and the beginning of August and have since then been threshed and winnowed and have shown a yield of a little over two and a half bags per acre.

"There were no noticeable diseases or insect pests. Small buck occasionally grazed the tops round the edges of the land, but did not harm the crop to any extent.

"As will be seen, the return per acre is over £7 10s. (with Sunn hemp at £3 per bag). This is very good, as maize, monkey nuts or sunflowers on absolutely raw virgin land, unfertilised and planted late, would have returned very little, if they returned anything at all; but, of course, Sunn hemp seed is at a very high price this year to buy and the labour in threshing by hand is very considerable. On the other hand, taking Mr. ———'s advice, I cut the crop fairly high and ploughed under about one and a half feet of stubble, so that this piece of land should be improved for this year's crop, which it certainly would not have been with any of the other crops mentioned.

"It seems to me that ploughing a green crop under (as was done in the case of my 29 acres) the first year is a very economical way of improving the soil, as the land is useless for anything else, or very nearly so, and thus one saves a year—or one season's crops—off that land in the end."

Farm Costings.

By T. J. Needham, Accountant, Department of Agriculture.

Judging by the questions put forward at the Farmers' Day at Gwebi and subsequently, there appears to exist some confusion regarding the inclusion of interest as a charge in cost accounts. This seems to be due to failure to discriminate between interest which is actually paid or payable on borrowed money (e.g., a bank overdraft) and interest which might be calculated on the proprietor's own capital employed in the farm.

First let us consider interest charged on borrowed money, whether paid or owing. This naturally falls into the category of administrative overhead expenses and therefore it is rightly allocated to the various live stock and produce accounts, in the process of costing the products of the farm. The basis upon which the allocation is made is in direct proportion to the capital involved.

Exceptions may occur, as when money is definitely borrowed for a specific object. If the money used for a particular enterprise was specifically borrowed for that purpose, then the cost of its acquisition should be charged direct to the account concerned. In all other cases interest

(paid or owing) on borrowed capital should be spread over the cost accounts in the proportion of the capital utilised in each department.

If the interest on money borrowed for a definite purpose, such as the price of a tractor, is not charged direct in the cost accounts, but debited to the profit and loss account instead, the cost accounts will fail to reveal the true relation between cost of production and sale price.

The second kind of interest (namely, interest which might be calculated on the farmer's own capital employed in the farm) is a totally different thing. As a general rule it should be left right out of the accounts.

The body of rules drawn up by the Agricultural Economics Committee of the English Ministry of Agriculture for the guidance of agricultural accountants lays it down that interest on capital should merely be borne in mind in considering whether the profit is sufficient reward for the capital, management and labour.

An exception to this general rule would occur, however, in the case of a farmer who owns one farm and rents another. For comparative purposes it would then be necessary to include interest on the proprietor's own capital as a cost in the accounts of the farm which is owned, to offset the rent charged for the other farm. If this were not done, the resulting cost prices would not be fairly comparable, and whilst it might always be remembered that the costs on the owned farm ought to be less than those of the other farm, the exact incidence of the rent on a pound of bacon or a gallon of milk would remain an unknown quantity.

Apart from this exception, the general rule of the Agricultural Economics Committee applies, and this rule will be followed in the cost accounts of the Gwebi Farm which are now in process of compilation and which will be available for publication shortly.

Differences of opinion are also sometimes expressed as to whether crops grown and consumed on the farm should be charged at cost of production or at market value. In the Gwebi Farm costings the following rule has been adopted. Where a crop is grown mainly for sale and partly used on the farm (e.g., maize), it is charged up to the animals or native labour at sale price less cost of marketing. Where

a crop is grown solely or mainly for use on the farm, the cost of production and not the market value is charged against the animals.

Examples of the application of this rule may be stated as follows. Bean hay may have a saleable value, but as it is not grown for sale it is charged to the animals at cost of production. On the other hand, maize is grown primarily for sale, and therefore any maize used on the farm (let us say for fattening oxen) is charged up to the fat oxen account at sale price less the cost of bags and cost of marketing it.

Tsetse Fly Regulations.

Government Notice No. 720 of 13th December, 1929, contains the following regulations, which have been promulgated in terms of the "Tsetse Fly Act, 1929":—

1. For the purpose of these regulations "game fence" means a fence erected by the Government to control the movements of game; "vehicle" includes motor cars, motor lorries, motor cycles and cycles.

2. No person shall take any ox, bull, cow, heifer, horse, mule or donkey into a fly area.

3. No vehicle shall enter or leave the Lomagundi fly area defined by Proclamation No. 10 of 1929, except by the following roads:—

(a) the road known as the Tchtchenini road leading northward from Richmond Farm in the direction of Tchtchenini Hill and passing through the southern game fence by the gate close to Chiziya Hill;

(b) the road leading northward from Mcheringe Farm in the direction of Doma Hill and passing through the southern game fence by the gate situated about one mile west of the Mvume River.

4. No vehicle shall enter or leave the Hartley fly area defined by Proclamation No. 10 of 1929, except by the following roads:—

(a) the road known as the Robb's Drift motor road leading westward from near Woodstock Farm in the direction of Robb's Drift on the Umniati River and passing through the eastern game fence by the gate situated about one and a half miles north of the north-western beacon of farm C.C.;

(b) the private road leading from Gambiza to Carfax Estate.

5. Every vehicle leaving the Lomagundi fly area shall pass through one or other of the guard gates erected across each road a short distance north of the southern game fence, and shall thereafter keep to the road between the guard gate and the gate of exit across the same road.

6. No motor car or motor lorry shall leave either of the fly areas defined as above unless the driver shall first drive the vehicle, with any passengers, into the fumigating chamber erected at the gate of exit or guard gate in such a way as to admit of all the doors or screens of the chambers being closed; each person shall thereupon submit to inspection and such treatment as may be deemed necessary to free him or her from tsetse flies, and the vehicle shall be treated in the chamber with the object of freeing it from tsetse flies. After treatment the driver shall remove the vehicle from the chamber by the exit door without unreasonable delay, and shall proceed immediately out of the fly area.

The above regulation shall not apply to the private road from Gambiza to Carfax Estate in the Hartley fly area.

7. No cyclist or motor cyclist shall leave either of the fly areas until he shall have submitted himself and any vehicle to inspection and such treatment as may be deemed necessary to free them from tsetse fly.

8. The treatment which may be adopted to free persons and vehicles from fly shall be set out in a notice which shall be posted at each guard gate or gate of exit where such methods are to be used, and the attention of persons leaving the areas shall be drawn thereto by the guard.

9. Any person contravening these regulations shall, on conviction, be liable to a fine not exceeding ten pounds (£10), or, in default of payment, to imprisonment with or without hard labour for a period not exceeding one month.

10. Nothing in these regulations shall apply to animals which, for experimental purposes, may, with the authority of the Minister of Agriculture, be moved into the said areas.

Prices of Maize in Europe.

The following information is extracted from the monthly review issued on the 15th December by the Standard Bank of South Africa, Ltd.:—

The price of imported maize in European markets appears to be governed chiefly by four factors, three of which affect the demand and one the supply. The demand in Europe for imported maize appears to depend mainly on the number of live stock in Europe, the European maize crop, and the production of other European fodder grains, of which the principal are oats and barley. The supply of imported maize depends mainly on the Argentine crop, supplemented in most seasons by a certain quantity from other countries, of which the most important is the Union of South Africa. The size of the United States crop appears to have comparatively little effect on European markets, for although the United States produces far more maize than all the other countries of the world put together, that country constitutes an almost entirely self-contained market, and in recent years her foreign trade in maize has been negligible.

For the first factor no very precise information is available, but the following figures, covering 14 European countries, indicate that immediately after the war the numbers of live stock in Europe increased rapidly until about 1923-24, when they were nearing the pre-war level, and subsequently more slowly:—

(Millions.)	Horses.	Cattle.	Pigs.
1913	14	65	46
1918-19	12	59	30
1923-24	14	64	43
1927	14	66	50

From the few figures available it appears probable that since 1927 the live stock of Europe has shown a slight decline

in number. The effect of this and of the other three factors is shown in the following statement:—

Oct.-Sept.	Production of Maize in Europe. (Mil. Centals.)	Production of Oats and Barley in Europe. (Mil. Centals.)	Production of Maize in Argentine and South Africa. (Mil. Centals.)	Total. (Mil. Centals.)	Av. prices of Argentine Yellow Maize in London. (Shgs. per 480 lbs.)
1921-22	225	750	123	1,093	34/2
1922-23	230	777	137	1,144	35/2
1923-24	265	900	177	1,342	37/7
1924-25	332	798	153	1,283	41/-
1925-26	351	914	202	1,467	30/9
1926-27	328	939	216	1,483	30/3
1927-28	262	897	209	1,368	37/9
1928-29	203	973	167	1,343	38/11
1929-30 (est.) ...	350	996	(Av. 180)	(1,526?)	?

The European crop of other cereals begins to come to market usually about the end of the third quarter of the year, and we have therefore calculated the European "Fodder Crop Season" from October in one year to September in the next. During this period the order of arrival of fodder products on the European market is firstly the European oat and barley crops, followed by the European maize crop from November to December, and lastly the Argentine and South African maize crops from May and August respectively.

The upward tendency of maize prices from 1921-22 to 1923-24, despite the increasing production, can be accounted for by the rapid increase in the live stock then taking place. The high prices of 1924-25 were clearly due to the poor crops of other fodder grains in Europe and of maize in Argentine, offset to some small extent by the good 1925 crop in South Africa, much of which was marketed before the end of the 1924-25 season. The 1925-26 and 1926-27 crops were good both in Europe and Argentina, and prices fell to a

low level. This affected South Africa comparatively little, for most of the 1925 crop was marketed before the fall in prices occurred, the 1926 crop was a failure and gave no surplus for export, and a considerable proportion of the fairly good 1927 crop was held over until the 1927-28 season, when the partial failure of the European maize crop caused prices to recover sharply. In 1928-29 the European maize crop again failed, while the Argentine crop was below normal, and prices were well maintained throughout the year. With the beginning of the European 1929-30 season, upon which we are now entering, the outlook has again changed sharply. Excellent crops both of maize and of other cereals have been reaped in Europe, the number of live stock has probably been reduced in consequence of the crop shortages of the past two years, and, unless the Argentine crop is very distinctly below normal, it seems certain that the supply of fodder grains in Europe will be larger than in any previous year. It is probable, therefore, that the level of prices during the present season will approximate more closely to that of the 1925-26 and 1926-27 seasons than to that of the past two years.

Southern Rhodesia Veterinary Report.

October, 1929.

AFRICAN COAST FEVER.

Mazoe District.—Four cases occurred on the infected portion of the Chiweshe Reserve.

Melsetter District.—One case on the farm Enhoek. The last case in this herd occurred in March, 1929.

ANTHRAX.

One case in the Mazoe area, and the in contacts were inoculated.

TRYPANOSOMIASIS.

Two cases in the Melsetter district. One in the Gatooma district.

QUARTER-EVIL.

Very few cases reported.

HORSE SICFNESS.

Two cases in the Insiza district.

SCAB.

Two flocks placed under licence in the Hartley district.

IMPORTATIONS.

From the Union of South Africa:—Bulls, 41; cows, 35; heifers, 16; calves, 3; horses, 20; donkeys, 98; sheep, 1,656; goats, 245; pigs, 6.

EXPORTATIONS (CATTLE).

To the Union of South Africa:—For local consumption, 1,527; for export overseas, 1,936. To Belgian Congo:—Slaughter, 2,941; breeding, 6. To Portuguese East Africa:—Breeding, 12.

EXPORTATIONS (MISCELLANEOUS).

To Union of South Africa:—Pigs, 82. To Belgian Congo:—Pigs, 152. To Northern Rhodesia:—Horse, 1; sheep, 236; goats, 23.

COLD STORAGE EXPORT TO THE CONGO.

Beef:—Carcases, 153; livers, 153; tails, 153; hearts, 153; tongues, 153; brains, 126; cheeks, 286. Calves:—Carcases, 20; heads, 15; feet, 64; tongues, 5. Sheep:—Carcases, 55; tongues, 68; brains, 68. Pigs:—Carcases, 60.

G. C. HOOPER SHARPE,
Acting Chief Veterinary Surgeon.

Southern Rhodesia Weather Bureau.

NOVEMBER, 1929.

Pressure.—During the month the pressure was generally low. Three high pressure systems were in evidence; the permanent anti-cyclone remained on the east coast through the month.

The first high moved round the south coast on the 11th and 12th and affected Rhodesia on the 13th. The second appeared in the west on the 20th, was well developed on the 22nd on the south-east coast, and then moved off. The third appeared in the west on the 27th and moved round the coast, being well in, but very weak on the east coast on the 29th.

Five distinct lows in all were recorded. The first originated on the west coast on the 1st; it passed round the Cape and was off the east and south-east coasts on the 4th and 5th, arriving off Beira on the 6th. The second, an equatorial low, moved down to the south coast on the 11th to 13th, and disappeared. A southerly low appeared off the Cape on the 14th, was off the south-east coast on the 15th and then moved off. An equatorial low developed on the 14th and 15th, extended into the Union and was off Durban on the 18th. The fifth low appeared in the north-west on the 18th and developed gradually, extending into the Union from the 23rd to the 27th, when it affected Rhodesia and then withdrew.

Rain.—The rainfall recorded during the month amounted to 3.84 inches, as compared with the normal of 3.21 inches.

Rain Periods.—Rain fell in two periods. It was fine from the 1st to the 9th, except for a few isolated showers on the 3rd. The first rain period was from the 10th to the 15th,

starting with isolated showers on the 10th; showers were numerous on the 11th. On the 12th scattered showers fell in the south, and on the 13th in the midlands. On the 14th showers occurred in the south, and a few isolated showers fell on the 15th. On the 17th isolated showers fell in the south, and showers were numerous on the 18th. On the 19th showers were fairly general in the south, and numerous showers were recorded on the 20th. On the 21st and 22nd showers were general, and on the 23rd and 24th light showers were fairly general. On the 25th and 26th showers were general and heavy, and on the 27th light showers were general. On the 28th scattered showers occurred, and on the 29th and 30th a few showers fell in northern Mashonaland.

RAINFALL.

Station.	1929. Oct.	1929. Nov.	Total to end of period.	Normal rainfall to end of period.
Zone A.:				
Bubi—				
Bembesi Railway ...	...	5.74	5.74	3.27
Glenarton ...	.44	1.64	2.08	2.77
Inyati ...	.26	9.49	9.87	3.51
Judsonia ...	.16	4.46	4.62	n.s.
Martha Farm ...	.04	4.46	4.59	2.69
Nduba Farm ...	.60	7.01	7.61	n.s.
Shangani Estate ...	.25	5.49	5.86	3.03
Bulalima-Mangwe—				
Centenary ...	.44	5.44	5.98	4.05
Kalaka ...	.33	8.50	8.83	2.93
Riverbank ...	.56	4.25	4.83	2.84
Solusi Mission ...	.47	4.32	4.79	2.74
Bulawayo—				
Fairview Farm ...	.45	...	.46	3.24
Keendale ...	.44	8.38	8.82	2.96
Crowhurst ...	...	3.89	3.89	3.01
Observatory ...	.18	4.52	4.55	3.01
Waterworks ...	.11	3.78	3.89	3.68
Gwelo—				
Brockenhurst ...	.08	6.89	6.97	n.s.
Frogmore ...	...	6.84	6.94	n.s.
Gwelo Gaol ...	.03	6.39	6.49	4.31
Riversdale Estate ..	...	...	...	4.05
Somerset Estate ...	.11	4.25	4.36	3.64
Insiza—				
Orangedale ...	.58	4.54	5.12	3.30
Shangani ...	.10	5.42	5.54	2.83
Thornville ...	.24	3.91	4.15	2.81
Nyamandhlovu—				
Gwaai Reserve ...	.75	3.07	3.82	2.03
Gwaai Siding ...	.19	3.73	3.92	n.s.
Naseby ...	.18	2.75	2.93	3.21
Nyamandhlovu Railway ...	..	3.79	3.79	2.64
Sebungwe—				
Gokwe ...	...	2.11	2.11	3.54
Umzingwane—				
Springs ...	.14	4.24	4.53	3.12
Wankie—				
Dett ...	.22	1.94	2.16	2.81
Matetsi Railway ...	.18	1.90	2.08	3.08
Ngamo Railway ...	.48	1.94	2.42	2.60
Rosslyn ...	...	...	...	n.s.
Sukumi ...	.11	2.35	2.46	2.31
Tom's Farm ...	.52	3.38	3.92	n.s.
Victoria Falls ...	.20	2.10	2.30	n.s.
Victoria Falls Railway ...	.23	1.92	2.15	3.40
Wankie Hospital ...	.08	.65	.73	2.42

RAINFALL—*(Continued).*

Station.	1929. Oct.	1929. Nov.	Total to end of period.	Normal rainfall to end of period.
Zone B.:				
Belingwe—				
Bickwell ...	.22	7.37	7.94	3.56
Sovelele ...	.60	...	1.02	1.80
Tamba ...	1.22	3.03	4.70	2.54
Wedza ..	.85	...	1.42	2.12
Bulalima-Mangwe—				
Bruwapeg ...	.12	...	.12	3.58
Empandeni ...	1.04	3.64	4.68	3.46
Fallowfields ...	.38	3.42	3.80	n.s.
Garth ...	.30	3.50	3.92	3.97
Maholi ...	.93	...	.93	3.95
Retreat ...	.69	3.50	4.31	3.37
Sandown ...	.87	3.56	4.74	3.60
Semokwe Reserve ...	.30	...	.39	n.s.
Tjankwa ...	.40	3.60	4.12	4.57
Tjompani ...	.29	3.04	3.39	3.36
Chibi—				
Bubye ...	.01	3.97	4.23	2.33
Mtendelende ...	...	...	.43	2.60
Nuanetsi Homestead ...	.20	3.64	3.84	2.67
Nuanetsi N.C. ...	1.21	...	1.21	n.s.
Gwanda—				
Gwanda Gaol ...	.25	3 80	4.09	3.06
Limpopo ...	.16	2.53	2 69	3.52
Mazunga ...	3.06	...	3.27	3.08
Mtetengwe ...	1.10	2.63	3.75	2 29
Tuli ...	1.21	4.02	5.25	2.91
Insiza—				
Albany ...	.74	5.20	6.01	3 16
Filabusi ...	.35	5.27	5.73	3.24
Fort Rixon ...	.17	3.53	3 70	2.88
Inyezi ...	.12	5.28	5.73	2.55
Lancaster ...	.31	4.92	5 34	2.71
Scaleby ...	.12	4.37	4.67	n.s.
Wanezi Mission ...	.13	5.15	5.55	n.s.
Matobo—				
Bon Accord ...	.11	4.93	5.14	n.s.
Fort Usher ...	.46	3 01	3.55	n s.
Holly's Hope ...	.24	5.49	5 74	2.63
Longsdale ...	2.87	4.49	7.36	n.s.
Matopo Mission ...	.43	4.58	5.55	3.41
Mtshabezi Mission ...	.05	4.28	4.44	3.21
Rhodes Matopo Park ...	1.90	3.20	5 24	3.81
Umzingwane—				
Balla Balla ...	.07	4.75	4.96	3.10
Essexvale ...	.09	6.31	6.40	2.45
Hope Fountain ...	.09	5.07	5 17	4.31

RAINFALL—(*Continued*).

STATION.	1929. Oct.	1929. Nov.	Total to end of period.	Normal rainfall to end of period.
ZONE C.:				
Charter—				
Bushy Park ...	...	3.13	3.13	4.31
Enkeldoorn ...	.16	4.09	4.41	4.61
Marshbrook ...	.82	8.16	9.15	4.43
The Range ...	1.28	5.64	7.16	4.87
Vrede ...	.45	6.61	7.21	4.39
Chilimanzi—				
Beacon Hill ...	.10	4.49	4.59	2.75
Central Estates ...	.36	5.64	6.00	4.82
Fourie's Post ...	...	2.70	2.70	3.21
Orton's Drift ...	...	5.55	5.55	3.68
Sebakwe Post ...	...	4.87	4.87	3.51
Umvuma Railway ...	.20	3.80	4.00	4.25
Gwelo—				
Cross Roads ...	.06	4.20	4.26	3.72
Delano Estate ...	.01	2.21	2.31	n.s.
East Clare Ranch ...	.14	3.62	3.86	2.65
Forestvale ...	.60	4.35	4.95	n.s.
Globe and Phœnix Mine ...	.34	7.95	8.38	3.79
Lannes Farm ...	.13	5.71	5.84	n.s.
Lalapanzi ...	.19	5.05	5.24	4.65
Lyndene ...	...	6.92	7.05	3.07
Woodendhove ...	.40	4.49	4.89	3.18
Wold Farm ...	.33	4.16	4.60	n.s.
Hartley—				
Ardgowan ...	...	3.88	3.88	3.85
Balwearie ...	.10	1.80	1.91	3.11
Battlefields ...	.22	3.03	3.25	3.55
Beatrice ...	.32	4.65	4.97	5.03
Carnock ...	1.09	9.26	10.39	5.32
Cromdale ...	.59	5.42	6.23	4.97
Currandooley ...	.20	2.96	3.20	n.s.
Eiffel Blue Mine ...	...	4.94	4.96	3.17
Elvington ...	.32	6.06	6.42	4.43
Gatooma ...	.23	4.11	4.34	4.10
Cotton Breeding Station ...	.32	...	.32	n.s.
Gowerlands ...	.56	5.42	5.98	4.97
Handley Cross ...	.17	2.86	3.08	n.s.
Hartley Gaol ...	.79	6.61	7.59	4.66
Hopewell ...	.38	6.21	6.71	4.73
Jenkinstown ...	.96	5.65	6.61	4.89
Maida Vale ...	.34	2.89	3.23	2.41
Meadowlands ...	.84	4.43	5.37	n.s.
Nyadgori ...	.68	4.88	5.56	4.90
Pulham ...	2.06	5.10	7.31	5.49
Ranwick ...	.26	7.90	8.22	4.59
Sunny Bank ...	.21	2.45	2.71	n.s.
Thorndyke ...	.93	4.84	5.77	4.86

RAINFALL—(*Continued*).

Station.	1929. Oct.	Nov.	Total to end of period.	Normal rainfall to end of period.
Zone C.—(Continued)				
Lomagundi—				
Argyle ...	1.30	5.94	7.24	4.32
Baguta ...	1.27	3.10	4.37	4.44
Between Rivers ...	.93	3.23	4.61	n.s.
Citrus Estate ...	1.30	1.46	2.88	3.77
Strathdon ...	2.41	2.80	5.37	n.s.
Darwendale ...	1.92	4.66	6.58	4.40
Dedsi ...	1.24	2.85	4.15	4.20
Dingley Dell ...	.43	2.49	2.92	3.44
Gambuli ...	1.61	1.65	4.26	4.83
Kapiri ...	.38	5.34	5.72	3.79
Kashao ...	.24	5.54	5.78	n.s.
Kenidia ...	1.71	4.62	6.37	n.s.
Mafoota ...	.97	3.58	4.78	3.76
Maningwa ...	2.01	3.04	5.17	4.08
Miami ...	.44	4.83	5.43	n.s.
Mica Field ...	.02	2.15	2.32	1.78
Montrose ...	1.55	6.65	8.22	3.44
Mpandegutu ...	1.34	3.10	4.90	4.33
Msina ...	1.12	3.86	5.06	n.s.
Mukwe River Ranch ...	1.52	5.32	6.84	4.21
Nyapi ...	1.85	2.53	4.69	3.69
Nywari ...	2.01	2.09	4.19	3.64
Nyati ...	2.00	2.73	4.73	3.26
Palm Tree Farm ...	1.46	4.30	5.88	3.52
Pendennis ...	.37	5.50	5.94	n.s.
Raffingora ...	.66	...	.91	3.27
Renardia ...	2.20	3.82	6.30	3.82
Richmond ...	.55	5.05	5.70	2.88
Robbsdale ...	.04	5.41	5.45	n.s.
Romsey ...	...	...	...	3.72
Silaler Estate ...	1.32	...	1.69	4.80
Sinoia ...	.97	3.37	4.43	4.10
Sipolilo ...	...	1.91	1.91	3.95
Umvukwe Ranch ...	.02	4.67	4.72	4.69
Woodleigh ...	2.54	2.72	5.63	3.60
Yeanling ...	1.43	5.72	7.15	3.53
Zebra Vlei ...	1.26	6.49	7.75	3.72
Marandellas—				
Rocky Spruit ...	1.25	8.10	9.35	5.88
Mazoe—				
Pembi Ranch ...	.17	3.03	3.20	n.s.
Salisbury—				
Avondale (Broadlands) ...	.85	3.42	4.30	4.27
Ballineety ...	.59	4.12	5.34	4.25
Botanical Experiment Station	.84	5.12	5.99	4.45
Bromley ...	1.33	7.15	8.65	4.79
Cleveland Dam ...	.44	6.41	6.87	4.30
Forest Nursery ...	.54	5.15	5.69	4.46
Gwebi ...	.63	3.83	4.82	4.13

RAINFALL—(*Continued*).

STATION.	1929. Oct.	1929. Nov.	Total to end of period.	Normal rainfall to end of period.
ZONE C.—(Continued)				
Salisbury (continued)—				
Salisbury Agricultural Dept.	.85	4.77	5.64	4.46
Sebastopol ...	1.24	5.18	6.60	4.93
Stapleford ...	1.35	4.24	5.65	5.40
Tobacco Experiment Station	1.49	4.95	7.09	5.02
Western Commonage ...	1.28	4.56	6.54	4.75
Sebungwe—				
Sikombela ...	.84	2.58	3.42	3.71
Wolverley ...	.15	2.02	2.17	2.61
ZONE D. :				
Darwin—				
Cullinan's Ranch ...	...	3.68	3.68	2.08
Mount Darwin ...	.12	3.94	4.10	3.94
Rusambo ...	.13	4.92	5.05	n.s.
Inyanga—				
Inyanga ...	1.36	3.90	5.34	4.91
Juliasdale ...	1.06	5.81	7.92	4.88
Rhodes Estate ...	.35	6.65	7.78	5.88
Makoni—				
Ardlamont ...	...	10.40	10.80	n.s.
Eagle's Nest ...	1.40	8.79	10.33	4.92
Mayo Ranch ...	.19	2.98	3.17	n.s.
Wensleydale ...	.80	5.97	7.10	4.83
Mazoe—				
Argyle Park ...	.36	4.04	4.45	2.63
Atherstone ...	...	4.71	4.81	3.16
Bellevue ...	.57	3.95	5.84	3.80
Bindura ...	.19	3.76	4.16	3.47
Ceres ...	.34	4.77	5.40	3.98
Chipoli ...	.42	6.35	6.77	4.40
Citrus Estate ...	.63	4.39	5.66	3.85
Craigengower ...	.12	3.61	4.00	4.53
Dandejena ...	.39	2.11	2.45	n.s.
Donje ...	...	3.07	3.21	n.s.
Frogmore ...	...	3.30	3.38	3.28
Glen Divis ...	...	4.12	4.56	4.09
Glen Grey ...	.13	3.37	3.95	2.79
Great B ...	1.51	3.58	5.42	3.48
Hinten ...	...	3.50	3.50	2.35
Horta ...	.02	5.24	5.26	n.s.
Kilmer ...	.19	4.14	4.46	3.98
Kingston ...	.04	3.83	4.43	4.89
Maienza ...	.27	...	1.01	3.72
Marston ...	.30	3.70	4.11	n.s.
Mazoe Dam ...	1.15	4.59	6.02	4.15
Mgutu ...	1.07	3.34	4.82	4.58
Muripfumba ...	...	5.03	5.57	3.52
Omeath ...	.99	6.14	7.13	3.61

RAINFALL—(*Continued*).

Station.	1929. Oct.	1929. Nov.	Total to end of period.	Normal rainfall to end of period.
Zone D.—(Continued)				
Mazoe (continued)—				
Pearson Settlement ...	.94	3.49	4.75	4.13
Riversdale Estate ...	.15	3.85	4.00	2.87
Ruia ...	...	6.46	6.46	4.24
Rustington ...	.34	6.03	6.74	2 69
Shamva Mine ...	.26	5.65	6.50	4.13
Stanley Kop ...	.48	5.19	6.06	3.89
Sunnyside ...	.13	5.69	6.22	3.94
Teign ...	.10	4.05	4.32	3.91
Usk ...	.17	6.07	6.34	3.83
Virginia ...	.08	3.03	3.41	3.37
Visa ...	...	4.60	4.60	n.s.
Woodlands ...	...	5.64	5.65	4.00
Zombi Farm ...	.33	5.05	5.82	3.89
Mrewa—				
Maryland ...	2.92	5.33	8.33	n.s.
Montclair ...	1.92	6.50	8.68	n.s.
Mrewa ...	.90	6.07	7.30	5.18
Nyaderi Mission ...	.89	6.39	7.55	3.93
Selous Nek ...	.19	4.86	5.05	4.63
Mtoko—				
Makaha ...	.05	3.07	3.12	3.82
Mtoko (N.C.) ...	...	5.55	5.80	3.94
Rukore ...	...	...	...	n.s.
Salisbury—				
Arcturus ...	1.20	8.05	9.73	4.79
Chindamora Reserve ...	.16	5.83	6.14	4.77
Glenara ...	...	3.49	3.62	4.93
Goromonzi ...	2.49	5.56	8.22	4.84
Hatcliffe ...	.47	2.71	3.18	4.87
Hillside (Bromley) ...	2.46	5.74	8.43	4.49
Kilmuir ...	.85	5.48	6.35	4.56
Meadows ...	1.18	7.85	9.10	4.97
Pendennis ...	.62	2.54	3.16	n.s.
Selby ...	1.65	3.31	5.21	4.86
Springs ...	1.02	5.41	6.67	5.09
Teviotdale ...	.42	2.69	3.11	n.s.
Vainona ...	.48	3.28	3.81	5.13
Zone E.:				
Belingwe—				
Belingwe (N.C.) ...	.24	6.91	7.54	4.17
Doro ...	.07	6.02	6.44	2.32
Shabani ...	.24	2.47	2.71	2.03
Bikita—				
Angus Ranch ...	1.65	2.87	4.53	2.56
Bikita ...	1.00	7.95	9.84	2.90
Devuli Ranch ...	...	5.13	5.13	3.28
Pamushana ...	1.37	4.29	5.66	3 97

RAINFALL—*(Continued)*.

Station.	1929. Oct.	Nov.	Total to end of period.	Normal rainfall to end of period.
ZONE E.—(Continued)				
Charter—				
Buhera ...	.82	4.09	4.91	4.66
Chibi—				
Chibi ...	.19	7.41	7.83	2.95
Lundi ...	1.25	5.66	8.44	2.70
Mpapas ...	.98	3.55	4.87	2.05
Chilimanzi—				
Allanberry ...	.97	7.08	8.23	4.60
Driefontein ...	.16	3.43	3.77	4.30
Felixburg ...	.78	5.05	5.83	4.32
Grootfontein ...	...	4.20	4.20	n.s.
Induna Farm ...	.03	3.42	3.48	4.90
Mtao Forest ...	.06	3.15	3.37	4.12
Mukowries ...	.56	3.29	4.03	n.s.
Thornhill ...	.56	3.68	4.30	n.s.
Gutu—				
Alheit Mission ...	1.15	...	1.15	3.87
Devuli Store ...	.83	6.82	7.67	n.s.
Eastdale Estates ...	2.33	4.62	7.07	4.57
Gutu (N.C.) ...	1.40	4.44	6.10	4.29
Glenary ...	2.40	5.65	8.21	4.11
Gwelo—				
Glencraig ...	.81	4.20	5.05	4.05
Partridge Farm ...	.27	5.60	5.89	5.35
Sheep Run Farm ...	.07	5.15	5.22	4.78
Inyanga—				
St. Trias' Hill ...	1.38	10.05	11.83	5.85
Insiza—				
Roodeheuvel ...	.50	5.89	6.60	2.92
Stoneham (Brac Valley) ...	.32	4.27	4.83	n.s.
Makoni—				
Bude ...	1.24	6.86	8.18	n.s.
Craigendoran ...	1.62	5.29	6.79	4.78
Forest Hill ...	.34	8.26	8.99	6.43
Gorubi Springs ...	...	...	...	5.20
Inyagura ...	...	...	...	n.s.
Kairidzi ...	.58	8.23	8.88	n.s.
Mona ...	1.39	9.09	10.56	6.08
Monte Cassino ...	2.30	7.59	10.91	5.77
Ruati ...	.14	6.97	7.57	n.s.
Rusape (N.C.) ...	2.08	7.61	9.83	n.s.
Springs ...	1.77	8.16	10.30	5.56
Whitgift ...	2.22	...	7.63	n.s.
Marandellas—				
Bonongwe ...	2.19	5.92	8.41	5.05
Detta ...	.57	7.56	8.35	4.26
Elandslaagte ...	.74	7.80	8.84	4.95
Lushington ...	.96	5.51	6.68	n.s.
Macheke ...	1.85	6.60	8.58	5.32
Marandellas (N.C.) ...	1.91	6.94	9.16	5.14

RAINFALL—(*Continued*).

Station.	1929. Oct.	Nov.	Total to end of period.	Normal rainfall to end of period.
Zone E.—(Continued)				
Marandellas (Continued)—				
Marandellas Estate ...	.39	7.62	8.01	4.39
Nelson ...	.31	8.25	8.56	4.32
Wedza Reserve ...	.10	5.98	6.08	n.s.
Wenimbi ...	1.43	4.64	7.32	5.66
Melsetter—				
Brackenbury ...	.21	7.38	7.59	6.21
New Year's Gift ...	.97	5.74	6.83	n.s.
Sabi Tanganda Estate ...	.34	3.51	3.85	n.s.
Ndanga—				
Bangala Ranch ...	.59	2.85	3.85	n.s.
Doornfontein ...	.94	6.84	8.23	3.80
Marah Ranch ...	1.20	3.37	4.57	3.55
Triangle Ranch ...	1.08	3.67	5.05	2.23
Zaka ...	.46	6.41	7.20	n.s.
Selukwe—				
Aberfoyle Ranch ...	.95	4.69	5.71	3.30
Hillingdon ...	.78	4.91	5.76	3.76
Impali Source ...	.64	3.79	4.43	3.29
Rio ...	.53	5.91	6 44	3.77
Safago ...	.22	6.83	7.27	4.11
Selukwe ...	1.88	6.74	8.82	4.29
Umtali—				
Argyle ...	2.43	3.87	6.39	4.59
Embeza ...	1.16	9.86	12.36	n.s.
Fairview ...	.62	6.87	7.93	4.59
Fern Valley ...	1.23	6.33	7.96	3.95
Jerain ...	.20	5.52	5.72	4.14
Mountain Home ...	1.16	7.26	9.76	n.s.
Mutambara Mission ...	.53	5.49	6.02	4.37
Odzani Power Station ...	.45	5 34	6.33	5.17
Park Farm ...	.94	4.63	6.16	3.47
Premier Estate ...	1.92	6.36	8.52	3.87
Sarum ...	.52	5.07	5.72	3.76
Sheba ...	1.17	9.96	13.86	n.s.
Stapleford ...	1.02	9.68	11.85	8.12
St. Augustine's Mission ...	.76	6.45	7.84	5.13
Transsau Estate ...	2.60	2.85	5.45	3.79
Umtali Gaol ...	.72	7.40	8.68	4.83
Victoria—				
Brucehame ...	.17	5.39	5.56	3.35
Cambria ...	.08	3.64	3.93	3.52
Cheveden ...	1.23	7.44	9.21	3.43
Clipsham ...	.16	4.56	4.92	3.78
Gokomere ...	.75	4.57	5.55	4.25
Kimberley Ranch ...	1.11	4.71	5.82	n.s.
Mashaba ...	.34	5.73	6.20	4.44
Miltonia ...	.11	4.03	4.14	n.s.
Riverdene North ...	.48	6.13	6.82	3.96
Salemore ...	.53	5.36	6.06	2.76

RAINFALL—*(Continued).*

Station.	1929. Oct.	Nov.	Total to end of period.	Normal rainfall to end of period.
Zone E.—(Continued)				
Victoria (Continued)—				
Silver Oaks ...	.28	4.88	5.36	3.68
Stanmore ...	.50	...	.50	3.94
Victoria ...	.22	4.29	4.70	4.02
Zimbabwe ...	.34	4.89	5.61	3.54
Zone F.:				
Melsetter—				
Chikore ...	2.29	6.03	9.31	4.67
Chipinga ...	2.33	8.14	10.97	5.56
Lettie Swan ...	2.11	4.37	7.42	n.s.
Melsetter ...	.89	4.32	7.82	6.39
Mount Selinda ...	1.37	6.60	9.16	6.84
Vermont ...	2.68	...	3.76	7.50
Umtali—				
Cloudlands ...	2.08	5.76	9.07	n.s.

Dates of Meetings of Farmers' Associations, Southern Rhodesia.

Name of Association.	Place of Meeting.	Secretary.	Jan.	Feb.
			1930	1930
Ayrshire—Sipolilo	Various farms	G. H. Cautherley	11	...
Banket Junction	Banket Hotel	A. M. Hutchinson	3	7
Beatrice District	Farmers' Hall, Beatrice	W. Krienke	30	27
Bindura	Bindura Farmers' Hall	W. E. Fricker	10	14
Bromley	Farmers' Hall, Bromley Siding	E. Taylor	1	5
Bubi	Queen's Mine	W. H. Perham	17	21
Bulawayo Landowners' and Farmers' Association	Library Buildings, Bulawayo	T. B. Hepburn	9	13
Chakari	Various farms	Lady Codrington	15	19
Daisyfield	Somabula (Jan.), Daisyfield (Feb.)	L. E. Edwards	11	15
Darwendale—Trelawney	Various farms	Charles H. Tanner	22	26
Eastern Districts	Farmers' Hall, Chidza	W. E. Richards	11	8
Enkeldoorn	Enkeldoorn	C. N. Ludlowe	7	4
Enterprise	Farmers' Hall	W. Stobart	7	4
Essexvale	Essexvale	Col. D. Judson	19	16
Felixburg—Gutu	Wheatlands (Jan.)	E. C. Fleetwood	11	...
Figtree Branch, R.L. and F.A.	Figtree Hotel	The Secretary	7	4
Gadzema	Gadzema Hotel	H. G. M. Liddell	10	14
Gatooma	Speck's Hotel	Col. J. A. Smith	18	15
Gatooma (Golden Valley Branch)	Golden Valley Hotel	C. K. James	11	8
Gazaland (South Melsetter)	Farmers' Hall, Chipinga	J. Ward	18	15
Greystone	Quarrie Farm	P. J. van der Walt	11	...
Gwanda	Lowenthal's Building, Gwanda	N. J. B. Nilson	18	15
Hartley	Hartley Hotel	Mrs. F. C. Watson	11	8
Headlands	Headlands	J. A. Eve	...	...
Hunter's Road	Hunter's Road	R. W. Twilley	25	22
Insiza South	Farm Lancaster	J. Campbell	9	...
Inyazura	Inyazura	W. P. Frudd	...	7
Lalapansi	Lalapansi	B. J. Ingle	11	8
Lomagundi	Sinoia	F. W. Robertson	...	...
Lomagundi West	Various farms	A. A. Bisset	12	9
Macheke	Farmers' Hall, Macheke	R. O. Jackson	...	...

Macheke Valley (Headlands) Farmers' and Tobacco Growers' Association	Various Farms	T. R. Colam	4	1
Makwiro	Makwiro	W. L. Parsons	17	21
Marandellas	Marandellas Farmers' Hall	E. Cruikshank	3	7
Marandellas, Southern	Various farms	B. V. Cherry	1	5
Mashonaland	Mashonaland Farmers' Hall, Salisbury	C. Lamb	10	14
Matobo South	Farmers' Hall, Malundi Farm	A. G. Allan	18	15
Matopo Branch, R.L. and F.A.	Farmers' Hall, Malundi	W. Mirtle	18	15
Mazoe (Concession)	Various farms	Douglas Southey	10	14
Mazoe (Glendale)	Farmers' Hall, Glendale	James S. Brown	8	12
Melsetter	Court House, Melsetter	J. C. Kruger	9	13
Midlands Farmers and Stockowners	Royal Hotel, Gwelo	T. R. van Rooyen	8	12
Ngezi-Umniati	Harvieston, Enkeldoorn	Miss Harvie	25	22
North Umniati	———	J. F. Eagar	Not	received
Norton and Lydiate District	Norton	R. D. Palmer	3	7
Nyamandhlovu	Nyamandhlovu	R. D. McLean	...	...
Odzi District Farmers	Odzi Hotel	M. Goldberg	4	1
Poorte Valley	Various places	A. D. Wilson	18	15
Que Que	Offices of the Que Que Sanitary Board	A. A. Ackerman	18	15
Rusape Farmers' Association	Rusape	R. Munch	4	1
Salisbury South	Various farms	P. Linton	29	26
Selukwe	The Hotel, Selukwe	W. T. Simpson	...	...
Shamva	Shamva Court House	W. Stanley-Stollard	17	21
Two Rivers Farming Association	Various farms	W. L. Parsons	18	15
Umboe (Branch of Lomagundi F.A.)	Various farms	G. T. Gover	11	8
Umvukwe Farmers' and Tobacco Growers' Association	Various ranches	Com. E. Wrightson	11	8
Umtali	Drill Hall, Umtali	A. Howat	2	6
Umvuma and District	Umvuma	S. T. Montgomery	Not	received
Victoria	Victoria	G. E. Lamb	4	1
Wankie District	———	F. H. Going	Not	received
West Umvukwe Farmers' Association	Various farms	G. H. Gordon	4	1
Western	Plumtree Hotel	The Secretary	11	8
Willoughbys	Willoughbys	A. E. Roberts	Not	received

Rhodesian Milk Records.

Official Milk Records.

Name of cow.	Breed.	Milk in lbs. to date.	Butter fat in lbs. to date.	No. of days.	Name and address of owner.
Boontjes of Kaalplaats	Friesland	2,017.50	62.58	90	A. T. Holland, Chatsworth
Shenfield Bulema	do	702.50	29.64	30	do do
Princess Park Primrose	do	1,612.50	45.44	60	G. A. Lyons, Bulawayo
De Grendel Hancy	do	1,379.00	43.85	30	do do
Planchette of Tolosa	do	977.60	33.23	30	F. B. Morrisby, Gwelo
Maldon Broadhooks	Shorthorn	491.00	18.11	30	Roberts & Letts, Heany Junction
Whinburn Daphne	Friesland	3,164.50	86.02	120	R. R. Sharp, Redbank
Middleton's Zoe	do	3,469.00	99.68	90	do do
Whinburn Primrose	do	3,327.00	135.91	120	do do
Middleton's Pamphylia	do	4,352.00	131.18	150	do do
Whinburn Spottie	do	3,988.00	137.71	150	do do
Whinburn Annette	do	1,521.50	46.97	60	do do
Whinburn Zephyr	do	736.50	19.88	30	do do
Whinburn Pansy	do	809.00	24.75	30	do do
Brightwell Rain	Red Poll	2,924.00	87.30	90	Government Farm, Matopos
Drinkstone Missie	do	854.70	33.24	30	do do

RHODESIAN MILK RECORDS (continued).

Semi-official Milk Records.

Name of cow.	Breed.	Milk in lbs. to date.	Butter fat in lbs. to date.	No. of days.	Name and address of owner.
Dapple ...	Grade Friesland	1,641.50	53.81	60	A. T. Holland, Chatsworth
Lily	do	599.50	16.24	30	do do
No. 1 ...	Grade Shorthorn	1,522.50	55.57	60	D. Jarvis, Gwelo
Barbara I. ...	Grade Friesland	3,392.90	97.14	90	F. B. Morrisby, Gwelo
Freezia ...	do	4,568.60	146.34	150	do do
Youth ...	do	2,473.10	46.48	120	do do
Daffodil ...	do	2,488.70	73.10	90	do do
Redbank No. 165	Shorthorn	1,907.50	63.32	60	Roberts & Letts, Heany
Bochen Sheila No. 127	do	1,371.50	37.37	60	do do
Whinburn Linnet	Grade Friesland	5,286.50	142.26	120	R. R. Sharp, Redbank
Whinburn Buttercup	do	4,316.50	139.42	120	do do
Whinburn Butterfly	do	3,392.50	93.29	120	do do
Whinburn Sidi	do	3,145.00	90.04	120	do do
Whinburn Blackbird	do	4,711.50	150.26	150	do do
Wren ...	do	1,249.00	31.10	30	do do
Bess	do	1,295.50	48.92	90	M. S. Smith, Gwelo
Martha ...	do	1,243.50	49.66	90	do do
Molly ...	do	1,311.50	43.84	60	do do
Thora ...	do	1,250.00	43.40	90	do do
Star	do	867.50	26.21	90	do do
Victoria ...	S. Devon	1,248.00	47.46	70	do do
Jane	Grade Shorthorn	932.00	37.90	70	do do
Grace ...	Grade Friesland	677.00	23.28	30	do do
Flora	do	583.00	20.11	30	do do

Export of Cattle from Southern Rhodesia, 1929.

Month	Union		England.	Congo		N. Rhodesia	Portuguese East Africa.			Total
	Slaughter		Slaughter							
	Johannesburg	I.C.S. for overseas	On hoof	Slaughter	Breeding	Breeding	Slaughter	Trek	Breeding	
January ...	66	...	...	2,222	272	12	...	...	...	2,572
February ...	84	...	...	656	...	...	12	...	...	752
March ...	12	1,353	...	1,845	1,803	19	24	...	...	5,056
April ...	242	1,842	75	2,933	1,131	...	38	...	22	6,283
May ...	224	4,318	620	1,508	2,966	17	24	...	...	9,677
June ...	538	6,322	...	2,989	936	34	48	...	...	10,867
July ...	799	6,417	...	1,417	85	14	...	...	...	8,732
August ...	1,358	6,457	...	2,530	684	21	...	...	...	11,050
September ...	1,699	4,406	...	884	7	185	...	...	...	7,179
October ...	1,527	1,936	...	2,941	6	...	...	...	12	6,422
November ...	634	254	...	1,445	...	...	...	...	...	2,333
December ...										

Farming Calendar.

January.

BEE-KEEPING.

This month is a slack one for actual hive work. Each hive should continue to be carefully watched to see that any attempt by the wax moth to gain a footing is at once stopped. In the great heat of this month, see that proper ventilation is supplied, as well as enough water. Precautions against the depredations of white and other ants should also be watched daily. Where possible, examine now and again the brood chamber for queen cells, and destroy them if not wanted. Requeening can be done where desired on the uniting system, if the apiarist does not know of the better plan of rearing his own queens. In the workshop have a spare hive or two complete and ready for occupation, well painted, for any new swarms that may be required in the coming months. Though the second honey flow of the season is not due to start until about March or April, there should be ample stores coming in meanwhile to keep all bees busy in breeding, nursing, and bringing the hive generally to full strength for the winter, as well as for their own daily food supplies. There will not be enough honey coming in now for surplus purposes, therefore see that the supers are not left on the hives to a greater degree than to give the inmates plenty of room to loaf in.

CITRUS FRUITS.

The planting of citrus trees should be completed if possible by the end of the month, for trees planted later may not harden up before the winter; they then become susceptible to winter injury from cold. This month is the best one for planting shelter belts to protect all varieties of fruit trees from the prevailing dry winds. Cover or green crops may be planted during this month; if the grove has been over-run with grass or weeds, sow the cover crop seed more thickly. This will assist in smothering future weed growth. Continue suppressing any undesirable shoots that may develop on the tree trunk or other parts of the tree. Drain any depressions that allow rain or irrigation water to accumulate at the base of the trees, for trees permitted to stand in water will speedily fall victims to disease or pest injury.

DECIDUOUS FRUITS.

Continue planting cover or green crops between the trees. These crops may then be turned under towards the end of the rainy season to furnish the necessary humus.

Summer pruning may be continued. Rub or break out any undesirable shoots that have a tendency to crowd each other; suppress all growths on the main stem from the ground level up to the main arms of the tree, for these are unnecessary. If next year's fruit crop is to be of good size and quality, the inner fruiting wood of a tree must receive sufficient air and light to mature fully. If the new growth is too dense it will prevent the fruiting wood from maturing, and poor crops will be the result. The thinning out of the summer growth will overcome this crowding and weakening of the fruiting wood.

Many fruits will be ripening during the month. Do not permit the fruit to become over-ripe on the trees; rather harvest it at the correct stage and store or sell the surplus.

Plant shelter trees if the orchard is exposed to the prevailing winds, as good crops of fruit cannot be expected from inadequately protected fruit trees.

CROPS.

If not already sown, put in the ensilage and fodder crops at once, such as maize and legumes, oats and other hay grass crops. Sow short season crops like haricot beans, linseed, buckwheat, peas, summer oats, gram and mung bean. Plant out grasses and kudzu vine for pasture. Ridge potatoes and cultivate thoroughly. Main crop can still be planted. Quick growing green manuring crops, such as cowpeas, soya beans and sunn hemp, may still be sown this month. Earth up ground nuts so that a small amount of loose soil is thrown over the crowns of the plants. This assists the formation of nuts. If not already done and where practised, legumes or long season oats such as Algerian can be sown under the maize crop for grazing and to add nitrogen and humus to the soil. Cultivate all growing crops well, and thoroughly eradicate weeds. Overhaul all hay-making implements and ploughs and get in thorough repair in preparation for the haying and ploughing seasons. Endeavour to mow grass fields early for hay and litter, and to obtain second cutting for hay in April. Fallowed lands or fields not yet planted may be disc-harrowed or ploughed to prevent weeds from seeding. Mow grass paddocks infested with annual weeds to prevent the weeds seeding. Prevent Mexican marigold and other noxious weeds seeding by hoeing or pulling out the plants by hand. Keep a sharp look-out for maize stalk borer. Cut off the tops of infested plants or treat them with a recognised chemical preparation. If topping is practised, remove tops from land, and bury, burn or feed them at once to farm stock. Watch the maize lands for witch weed. Prevent witch weed plants from seeding by cultivation and by hand-pulling the plants. Make as much manure as possible by placing grass and litter in cattle kraals, pig sties and stables. If there is stumping and clearing to be done, push on with it. Endeavour to get as much of the new virgin land as possible broken up during this and the two following months.

DAIRYING.

During the months of December and January veld grazing is usually plentiful, and very little extra feed in the form of concentrates is required for dairy stock. It should be borne in mind, however, that heavy milking cows are unable to satisfy their requirements for milk production from veld grazing alone, and should receive a daily allowance of grain; the latter should be fed at the rate of 2 lbs. for every gallon of milk produced daily, i.e., a cow producing three gallons of milk should receive 6 to 7 lbs. of concentrates. An excellent mixture for this purpose is one consisting of four parts maize meal and one part ground-nut cake.

During wet weather, the provision of a clean dry shelter for calves is essential; the latter should not be crowded together in a small, damp, badly ventilated pen or muddy kraal. When treated in this manner, a calf is very liable to contract various ailments such as scour, etc. Scour is entirely preventable, and is usually caused by over feeding, or feeding from dirty pails, feed boxes, etc. Calves which contract scour should be isolated, the milk ration reduced, and they should be dosed with a few tablespoonfuls of castor oil.

Under the weather conditions which now obtain, cream should be despatched to the creamery at least three times a week. It is of the greatest importance that cream should be cooled immediately after separation, and should be kept cool while on the farm and whilst in transit to the railway station or siding. While the cream is being cooled, it should be frequently stirred, using a stirrer with a plunger attachment. Warm, freshly separated cream should not be mixed with old cream which has already been cooled. Cool the fresh cream first and then mix thoroughly with the old cream. Gassiness is a common defect in the cream received at the creameries at this time of the year, and is caused by gas-producing organisms with which the milk and cream are contaminated. These organisms abound in mud, manure, etc., and develop and multiply very rapidly at high temperatures. Any precautions therefore which may be

taken to eliminate dirt, manure, etc., from the milk and to keep the cream cool will prevent the development of gassiness.

As the night temperatures are fairly high, cheese-makers should not attempt to use night's milk for cheese-making; morning's milk plus a starter will give the best results. Gouda cheese-making operations are not usually successful at this season of the year, owing to the poor quality of the milk and the prevalence of gassiness. This type of cheese is best manufactured during March and subsequent months.

ENTOMOLOGICAL.

Maize.—Late planted crops are subject to attack by snout beetles, grasshoppers and crickets. Poisoned bait is a useful remedy. Write for particulars. Plants infested with stalk borer may be cut out, removed from the land and destroyed. Crops planted after the new year are frequently attacked very heavily by stalk borers of the second brood (February to March) and are commonly of little value, except for ensilage. If the lands are allowed to become weedy, especially with grasses, during this month, loss may occur from leaf-eating caterpillars when the lands are cultivated. Danger from the army worm is also greater in weedy than in clean lands.

Tobacco.—Most pests of this crop may be active during January, e.g., wireworms, surface beetles, crickets, grasshoppers, stem borer, leaf miner, etc. Consult article on tobacco pests in "Rhodesia Agricultural Journal," January, 1928.

Potato.—This crop may be sprayed with arsenate of lead (powder) 1 lb. in 25 gallons of water if attacked by leaf-eating ladybirds, blister beetles or other leaf-eating insects. This poison may be combined with Bordeaux mixture when spraying against early blight.

Kitchen Garden.—Marrow and cucumber plants about to set fruit may be sprinkled regularly with the following formula to destroy fruit flies which "sting" fruit:—Arsenate of lead (powder) 1½ ozs., molasses ½ gallon or cheapest sugar 2½ lbs., water 4 gallons. To destroy leaf-eating insects generally dust plants with arsenate of lead (powder) 1 part in 20 parts of finely ground maize meal or finely sifted slaked lime. Aphides (plant lice) may be treated with soap 1 lb. in 5 gallons of water, or tobacco wash, or simply by regular spraying with a forceful stream of cold water from a spray pump.

Fruit Trees.—Deciduous fruits are subject to attack by large beetles, which should be destroyed by jarring into a net and dropping thence into a tin containing water with a film of paraffin oil on the surface. Trees should be covered in mosquito netting to protect the fruit from fruit-piercing moths. The large adult beetles of the fig borer may be seen on the young shoots and should be destroyed. Borers in the trunks of the trees may be killed by injecting a little carbon bisulphide.

Mosquitoes, House Flies, etc.—Screen windows and doors. Destroy breeding places around homestead. House flies may be poisoned cheaply with sweetened arsenite of soda solution. Write for directions.

When in doubt as to the identity of any pest or the method of dealing with it, apply promptly to the Chief Entomologist, Salisbury, bringing or sending specimens of the insects concerned. Note, however, that it is sometimes feasible to prevent injury from pests for which no practical remedy is known. Farmers should therefore endeavour to obtain some knowledge of the pests of the crops they are growing through the articles published in this Journal.

FLOWER GARDEN.

This month requires all one's energy in the flower garden. Annuals may still be sown for late flowering before the season is over. Planting out should be done as early as the weather permits, and advantage taken of a dull day after a shower for this work. If care be exercised much smaller

plants may be put out than would at first be thought advisable, as with attention these will make stronger plants than larger ones, which are more likely to receive a check. The soil requires constant stirring, owing to the packing caused by the rains and for the eradication of weeds, which are now very troublesome. All plants should be kept free of dead and decaying matter.

VEGETABLE GARDEN.

Turnips, carrots, cabbages, lettuce, etc., may be sown for carrying on during the winter months. Potatoes may be planted this month for keeping through the winter. Weeding and cultivating between the rows should be continually carried on.

FORESTRY.

If the rains are seasonable, plant out evergreen trees, such as gums, cypress, pines, etc. Fill in all blanks as soon as they are noticed, and do not leave them until the following season. Planting should be done on a wet day, or, failing that, on a dull day, or late in the afternoon. Great care should be taken to see that the trees are not planted out any deeper than they stood in the tins.

POULTRY.

All houses must be absolutely watertight, the floor raised well above the level of the surrounding ground, thus preventing water seeping in and making it damp. The birds themselves should not get wet, and no pools of water should be seen in the runs.

Foodstuffs must be kept absolutely dry, otherwise they will become mouldy and sour, causing disturbance of the intestinal tract, illness, and perhaps death; certainly a diminution in the number of eggs.

Some of the birds will now be in moult. To get them through it quickly give more sunflower seed, some monkey nuts, plenty of green food, especially cabbage, kale, etc., plenty of milk or some meat, a little sulphur in the dry mash (one teaspoonful to 1 lb.); also stew two dessert spoonfuls of linseed in a pint of water to a jelly, mix this to a crumbly consistency with mealie meal or bran, and give about one dessert spoonful to each bird daily. Keep the birds dry during the rains, otherwise the egg output will decrease.

Do not hatch any more turkeys till after the rainy season is over. Turkeys should not be penned up, but allowed on free range.

Ducks must be treated in almost exactly the reverse manner to what turkeys are. They should be kept in a small run; nearly all their food should be wet mash, bran, pollard, mealie meal, meat meal and milk, as much as they will eat three times a day, *i.e.*, they should practically be allowed to spend their existence eating and sleeping. Big duck breeders often give a fourth meal by lamplight at 10 p.m., and the first meal is given at sunrise.

STOCK.

Cattle.—The recommendations for December apply equally to this month. Bulls should be returned to the herd during the month if a September or October calving season is desired.

Sheep.—Continue as recommended for December. If heavy rains are experienced a daily ration of a quarter of a pound of maize per ewe will keep them in condition, and will often prevent much trouble arising from poverty and anæmia. Those who favour autumn lambs must put the ram again with the flock in February, and should therefore now take steps (if necessary) by supplying a little extra feed as above recommended to fit the ewes for mating. A little forethought of this kind will tend to increase the stamina of the lambs and to bring the ewes in season more or less together, so that a protracted lambing season is avoided.

TOBACCO.

Cultivation should be systematically continued, and no foreign vegetation allowed in the tobacco field, as weeds and grass induce insect attacks.

All backward plants should be given special attention, and an additional application of fertiliser to hasten growth, so that the plants ripen as uniformly as possible. Curing barns should be placed in proper condition on rainy days, and all tobacco appliances should be placed in proper order for the rush of work during the curing season. Early planted tobacco may be ready for topping during the latter part of the month, and the common mistake of topping too high should be avoided. Go over the field carefully and select typical, uniform and disease-free plants for producing seed for next season's crop. All plants should be properly primed at the same time that the tobacco is topped.

VETERINARY.

Horse sickness may now be expected, especially in districts where early heavy rains have occurred. Blue tongue in sheep will also be prevalent.

WEATHER.

Heavy rain is to be looked for, and during this month we may normally expect nine to twelve inches on the eastern border, eight in the north, and seven to seven and a half as one travels westwards or southwards. At this time of the year the rainfall tends to be heavier in the eastern than in the western portions of the Colony, whilst prolonged steady rains take the place of the thunder showers which marked the earlier part of the wet season. The growing period is at its height, and high temperatures are registered.

February.

BEE-KEEPING.

In most parts of the two Rhodesias this month is one of fair activity for all bees, there being as a rule quite enough nectar, pollen, etc., available for all ordinary purposes of rearing, building cells, etc., and working generally for the due upkeep of the colony for the present as well as for the coming winter. Whether there will be any surplus honey for them to store will depend upon what crops the farmer may have on hand at this time, as the usual flora of the land will not supply it until the regular second flow of the year is due, which should be in March to April, according to the season.

Watch carefully for robbers, though, with well attended hives and due care in handling, there should be little to fear in this direction; strong, well filled hives can always repel robbers, which are only successful with weak colonies, and these no apiarist should ever have under his care. Mark well last month's advice, i.e., to have everything in readiness for dealing with unexpected new swarms that may be required as they may come, for nothing is more disconcerting or annoying than to be unready when the time arrives. This applies especially to any swarms that may come from the apiary, for a few days only of neglect of such a hive may easily lead to the moth taking early possession of the combs, and in practically a few hours destroy fully drawn-out combs that would otherwise be of much value for after working upon. Such combs, as they are available, should at once be packed away in an air- and moth-tight box or tin for after usage.

CITRUS FRUITS.

Newly-planted citrus trees should be kept free of weed growth likely to exclude necessary air and light for their normal and healthy development. Citrus trees planted in February seldom give satisfactory results; late planted trees do not mature their new growths before winter, and they are more susceptible to winter injury or the ravages of disease or insect pests. The early planted cover crops will be fit to plough under by the end

of the month. Do not delay this operation for fear of the rains ending abruptly. If this occurs, great difficulties will be experienced when attempting to plough in the green crops. Keep all young shelter belt trees free of weed growth, and loosen the soil round their stems fairly frequently to eliminate possible ant injury. This is one of the best months for budding citrus trees, either in the nursery or grove—trees that are to be top worked to profitable varieties. Late out-of-season fruit that may have set during December-January should be stripped from the trees. This fruit is valueless for export, and if allowed to mature, will affect the main crop setting of fruit.

DECIDUOUS FRUITS.

When sufficiently mature, plough under cover crops. This should be possible towards the end of the month.

Summer pruning should be completed early in the month; little or no advantage will be derived from trees treated when the new wood reaches maturity.

Do not allow fruit to become over-ripe, then expect remunerative prices for it. If it is harvested at the correct stage, then well graded and neatly packed, good prices may be expected for the surplus fruit sold.

This is a good month for budding deciduous fruit trees.

CROPS.

Cultivate, and keep on cultivating as weather permits, to destroy weeds. Continue to look out for stalk borer, and, if infection is discovered, deal with infested plants as advised in January notes. Watch witch weed and continue cultivating and hand pulling it. Plough under witch weed, smother and trap crops. Where practised, maize can be under-planted with sweet potato vines after the last cultivation for the following season's requirements. Potatoes and ground nuts will probably need to be ridged again. Catch crops of quick maturing beans, such as tepary bean, also buckwheat, can still be sown. Keep down all noxious weeds. This work can be undertaken on wet days. Make veld grass hay whenever a few days of fine weather permit. Early mowings provide the best hay. Seed beds of onions for early winter planting can be sown towards the end of the month. Keep potatoes in a cool shed, well ventilated. Pick over any potatoes in storage and remove bad ones. Continue to make as much farm manure as possible. Begin to ride manure and place in heaps handy to the lands to be manured.

DAIRYING.

This is normally the flush season as far as dairy produce is concerned; dairy cattle are usually in good condition and cows of average capacity should be able to subsist and maintain a full flow of milk on veld grazing alone. Calves may be given a few hours' exercise on bright, sunny days; young stock, however, should not be allowed to run and graze with the herd, and are best kept in a cool, airy pen opening on to a small shady paddock, where they can obtain a little exercise.

A good quality of sweet hay and water should always be available for young calves.

Cream deteriorates very rapidly under the conditions which obtain at this time of the year, so that every precaution should be taken to keep the cream as cool as possible pending despatch to the creamery. As there is a greater strain than usual on the separator during the flush months, frequent oiling is necessary, and care should be taken that the machine is mounted on a level foundation. The separator and all other dairy utensils must be cleaned immediately after use. First rinse the utensils with cool or lukewarm water, then wash thoroughly with boiling hot water, washing soda and a scrubbing brush; scald finally with boiling water.

The cheese in the storeroom is apt to develop mould during wet weather. If the cheese is well made and pressed and has a smooth rind, this mould is merely superficial and will not penetrate into the body of the

cheese. Rubbing the cheese with a cloth moistened with a weak solution of formalin or permanganate of potash usually checks the development of mould. During these months care must be taken not to use over-acid milk for cheesemaking, and great care should also be taken of the starter. If this latter shows any signs of gasiness or develops any disagreeable flavour or odour it should be discarded and replaced by a fresh, clean starter. The cheese storeroom must be kept dark and flies excluded.

ENTOMOLOGICAL.

Maize.—The first brood of the stalk borer matures this month, and the young of the second brood may be found amongst the younger leaves. Weeds should be kept down.

Tobacco.—Stem borer, leaf miner and budworms are the chief pests likely to be troublesome. Plants in the field found infested with the first two insects should be heavily pruned or destroyed. The budworm caterpillars can usually be hand picked during the process of topping. (See "Rhodesia Agricultural Journal," December, 1927.)

Potato.—Ladybirds and tuber moth may call for attention. The latter, when very bad, sometimes causes considerable wilting of the crop besides attacking tubers. The ladybirds may be destroyed by spraying with arsenate of lead 1 lb. to 16 gallons of water.

Cabbage Family.—All members of the family are liable to be attacked by the sawfly and webworm. The sawfly may be effectively controlled by dusting during a dry spell with Paris green and slaked lime (1 lb. Paris green and 20 lbs. slaked lime).

Melon Family.—The most important pest is the melon fly, which "stings" the fruit of all species of gourds. Destroy all badly "stung" fruit and spray remainder thoroughly with arsenate of lead (2 ozs. in 4 gallons of water) to which 2½ lbs. of cheap sugar has been added.

Deciduous Fruit.—Apples, pears and late peaches suffer chiefly from fruit moths, which puncture the fruit. No remedy available except covering the trees with netting.

Fig.—The fruit is liable to the attack of the fig weevil. All infested fruit and all wild fruit should be collected and destroyed. The borer in the stem may be killed by inserting a little carbon bisulphide into the burrow and sealing it up.

Poison Baiting.—Poison baiting against surface beetles, cutworms, etc.: No really effective bait has yet been discovered for cutworms, but the following poisoned bait is recommended for surface beetles, etc.: Paris green 1 lb., 180 lbs. maize meal. Mix thoroughly in dry state and add water until the material is of the consistency of a dough. Roll into small balls and place under shade. Spread in the evening.

FLOWER GARDEN.

Sow carnations, phlox, pansy, verbena, gilias, larkspur, dianthus and pentstemon. The flower garden should be now looking its best, nearly all plants being in bloom. Old and dead flowers should be constantly removed, except when the seed is required. Seeding of the plants shortens their flowering period. All runners and climbers should have constant attention, and be tied up and trained, otherwise they will be damaged by the wind. Dahlias, chrysanthemums and carnations will require staking, as they become top heavy when in flower. Make the first sowing of winter-flowering sweet peas.

VEGETABLE GARDEN.

Sow now—Beans, beet, cabbage, cauliflower, lettuce, peas, onions, carrots, parsnips, turnips, endive, kohl rabi, rhubarb and all herbs.

FORESTRY.

Tree planting operations should be carried out on dull, showery days or late in the afternoons. Take care in setting out the plants, avoid

bending the roots, and do not plant deeper than the plants were in the seed beds or trays. Steps should be taken to prepare seed beds for the slower growing species, i.e., pines, cypresses and callitris, and seed of these species should be sown for the following season's planting.

GENERAL.

This is a busy time for the farmer. Weeds will be very much in evidence and difficulty will be experienced in keeping them under. Stock will have fully recovered their condition, but ticks will be troublesome. The dipping tanks must be fully utilised now.

POULTRY.

Cockerels for future breeding should now have been selected, and those not good enough sold for killing. It pays far better to get rid of all of the latter, even if only at 1s. or 1s. 3d. per lb., than to keep them on, eating their heads off, in the hope of getting a better price. Those good enough for breeding, and they must be good, should be kept till about June; there is a demand for such up to this month. Any surplus at this time should be eaten or sold for what they will fetch. Of those selected for breeding purposes, the owner should keep the best one or two for his own use, with another as a reserve. No poultry keeper should sell his best stock, no matter how high a price is offered for it.

By the end of this month the birds selected for breeding should be mated up. If it is possible, the birds selected for breeding should be given a run on free range for three weeks or so before being put into the breeding pen and fed sparingly; better fertility and better chicks will be the result. If it is possible to run the birds selected for breeding away from the others during the whole of the breeding season, all the better. Any hens that become broody should be kept broody by setting a few china eggs under them until such time as eggs from the breeders come in. Broody hens at this time and for the next five months are valuable.

During the rainy season the scratching litter must be kept dry; if it gets wet it is useless.

Duck hatching can be continued all the year round; the main points are that the young ducks must be kept out of the sun and sleep on dry grass. Nothing is more fatal to ducklings than sun, and dampness at night; and the latter applies, too, to the adults. Unless a dry shed, with a dry, soft layer of chaff or sand, etc., covering the floor of it, is available, it is not wise to hatch turkeys till after the wet season is finished, for it will be labour, food and eggs wasted. If the young turkeys get wet they are almost certain to die. This and the feeding on wet mashes instead of dry food, chopped onions and thick milk are the chief reasons for non-success in the breeding of turkeys.

STOCK.

Cattle.—Grass should now be at its best, and no anxiety need be felt about feed. In the case of milking cows which have been fed during the earlier rainy months, a little mealie meal, cotton cake or ground nut cake may still be given at milking, if only to bring them quietly to their places. The importance of a clean, light, airy and well-drained shelter for calves cannot be over-estimated. Calves up to three or four months old do not require a great deal of exercise, and on wet days are better left in a dry shed with a little sweet hay. A few hours' exercise on bright days in short grass is all they need. Vigilance in keeping down ticks must not be relaxed. These remarks apply specially to milking herds and to cattle that are kraaled. Cattle running at large need little attention beyond dipping, and if the calves are not desired from November to March, the bulls must now be taken out of the herd. Weather permitting, no opportunity should be lost of getting in a supply of good sweet hay before the grass is too old. A good lick should always be provided.

Sheep.—Vleis and low-lying ground must be avoided. Sheds should be airy, dry and clean. If grass seeds are troublesome to woolled sheep, an

area should be mown for them, or when rain begins to slacken, they may be shorn. If wire worm is troublesome, dose regularly each month with wireworm remedy.

TOBACCO.

The early tobacco should now be ready for curing. Care should be taken to select only thoroughly ripe leaf for filling the barns, so that the cured product will be uniform. Topping, priming and suckering should be given attention. Selected seed plants should be carefully watched. New land intended for tobacco next year should be ploughed this month, so that all organic matter turned under may be converted into humus before planting time next season.

WEATHER.

This is often the wettest month of the year, with marked differences of from 10 inches to 15 inches on the eastern mountain ranges, 7½ inches over Mashonaland, 4 inches to 6 inches in Matabeleland, and least, but still some, rains in the Limpopo Valley. The rains may be expected to decrease in intensity after the middle of the month if the season is normal.

Notes from the "Gazette."

"*Gazette*" *Date.*	*Items.*
	MAIZE ACT, 1925.
22.11.29.	His Excellency the Governor has been pleased, in terms of section 4 of the "Maize Act, 1925," to prescribe white dent maize as the maize which shall be grown within the areas described hereunder:—An area in the Mazoe district bounded by and including the following farms: Bonny, The Vale, Glamorgan, Burnside, Eaglescliffe, Bemberero, Ruwanga, Rusikana, Bythorn, Mumurgwi, The Poort, Palm Grove, Nyamadomba, Masimbi, Riverbend, Mukore, Grahamsdale, Mullingar, Mumwi, Highlands, Kendal, Rustington, Caledon, Nzua, Dengeni, Glen Avilion, Woodlands, Maizelands and Arcadia.—(G.N. No. 688.)
	An area in the Hartley district bounded on the east by the western boundary of the Mondora Reserve between the Umfuli and Umsweswe Rivers; on the south by the Umsweswe River; on the west by the Mzoe River, the western boundaries of the farms 7, Elgivo, DD, CC and Carfax Estate, the northern boundary of Carfax Estate, the western boundary of Rhodesian Plantations, and a line drawn from the north-west beacon of Rhodesian Plantations to the junction of the Umfuli and Yabongwe Rivers, and on the north by the Umfuli River. —(G.N. No. 689.)
	REMOVAL OF SHEEP AND GOATS.
22.11.29.	His Excellency the Governor-in-Council has been pleased, under the provisions of section 5 of the "Animals Diseases Consolidation Ordinance, 1904," as amended by the "Animals Diseases Amendment Ordinance, 1918," to suspend the Regulations published under Government Notice No. 132 of 1925, requiring the written permission for removal of sheep and goats.—(G.N. No. 666.)
	TRAFFIC ACROSS BRIDGES AND CULVERTS.
29.11.29.	His Excellency the Governor-in-Council has been pleased, in terms of section 3 (2) of the "Roads and Road Traffic Act, 1925," to approve of the following regulations:—
	1. No vehicle, the weight of which (including the contents thereof) exceeds fifteen tons, shall be taken across any bridge or culvert on any road declared to be a main, district or branch road in terms of the "Road Regulations, 1896."
	2. No vehicle shall be taken across any bridge on any road, as defined in the preceding section, at a speed in excess of ten miles an hour.—(G.N. No. 694.)

"*Gazette*" *Date.*	*Items.*
	DISTRICT ROAD.
29.11.29.	The following has been declared as a district road:— Starting at a point on the main Umvuma-Enkeldoorn road about five miles from Umvuma; thence proceeding in an easterly direction across the farms Palgrave, Wildgrove, Lovedale and Luck, the north-easterly corner of the farm England; thence across the farms Scotland, Bultfontein, Washbank and Jackalsbank to the common boundary of the farms Jackalsbank and Mac; thence in a northerly direction generally across the farms Mac, Landskroon, Hugosfontein, Vleiplaats, Leuwfontein and Swartfontein to the boundary of the Enkeldoorn Commonage.—(G.N. No. 695.)
	ROADS AND ROAD TRAFFIC ACT, 1925.
13.12.29.	Government Notice No. 613 of 1929 has been cancelled, and, in lieu thereof, His Excellency the Governor has been pleased, in terms of section 3, sub-section 4, of the "Roads and Road Traffic Act, 1925," to limit the use of the portion of the road described below to motor traffic and vehicles drawn by horses, mules or donkeys:—That portion of the road declared as a district road under Government Notice No. 612, dated 18th October, 1929, starting from a point where the said road crosses the boundary of the farms Dawsons and Klipfontein, and from that point in a southerly direction through farms Klipfontein, Empandine, Home, Cleveden, Apology, Castle Block, Ingwesi Ranch and Sheshamangwe to a point on the east bank of the Sanchakwe River.—(G.N. No. 725.)

Seeds for Sale, Gwebi Farm.

		s.	d.
Boer Manna	per lb.	0	4
Sunflower Seed (Large Black)	100 lbs.	16	0
Sweet Potato Slips	per bag	6	0
Napier Fodder Roots	per bag	6	0
Edible Canna	per 100 "tubers"	9	0

All prices quoted are for *delivery free at any station or siding* in Southern Rhodesia. Before sending cheques, intending purchasers are advised to ascertain that the seeds, etc., required are still available. Cheques should be made payable to "Gwebi Farm." All orders and enquiries should be addressed to the Chief Agriculturist, Department of Agriculture, Salisbury, *not direct to the Gwebi Farm.*

Departmental Bulletins.

The following Bulletins, consisting of reprints of articles which have appeared in this Journal, are available for distribution free of charge to applicants in Southern Rhodesia only. Outside Southern Rhodesia, 3d. per copy.

AGRICULTURE AND CROPS.

No. 174. Notes on Hop Growing, by H. G. Mundy, F.L.S.
No. 218. Useful Measurements for Maize, by J. A. T. Walters, B.A.
No. 225. Napier Fodder or Elephant Grass, by J. A. T. Walters, B.A.
No. 278. New Crops for Rhodesia, by J. A. T. Walters, B.A.
No. 362. The Cultivation of Rice, by H. G. Mundy, F.L.S.
No. 374. Fibre Crops, by J. A. T. Walters, B.A.
No. 403. Florida Beggar Weed, by H. G. Mundy, F.L.S.
No. 429. Propagation of Kudzu Vine, by H. C. Arnold.
No. 442. Swamp or Irrigation Rice, by K. V. Yoshi, Bombay.
No. 510. Check-row Planting of Maize, by H. G. Mundy, F.L.S.
No. 513. The Carob Bean in Rhodesia, by J. A. T. Walters, B.A.
No. 541. The Potato Crop under Irrigation, by G. R. Syfret.
No. 545. Artificial or Synthetic Farmyard Manure, by H. G. Mundy, Dip.Agric., F.L.S.
No. 550. Onion Growing under Irrigation, by C. Mainwaring.
No. 561. Wheat Growing in Rhodesia, by C. Mainwaring.
No. 568. The Treatment of Arable Land, by G. N. Blackshaw, O.B.E., B.Sc., F.I.C.
No. 581. Leguminous Crops for Stock and Soil Improvement in Southern Rhodesia, by C. Mainwaring, Agriculturist.
No. 590. Rye, by H. W. Hilliard, Junior Agriculturist.
No. 591. Maize Export Conference Proceedings.
No. 598. Drought-resistant and Early-maturing Crops for Areas of Late Rainfall, by C. Mainwaring.
No. 599. Rhodesian Soils and their Treatment, by E. V. Flack.
No. 601. Maize for Export, by S. D. Timson.
No. 603. The Production of Maize in Southern Rhodesia, by C. Mainwaring, Agriculturist.
No. 627. The Growing of Potatoes in Southern Rhodesia (Revised), by C. Mainwaring, Agriculturist.
No. 630. The Storage of Seed Potatoes, by H. C. Arnold.
No. 634. Barley, by P. V. Samuels.
No. 643. Noxious Weeds in Southern Rhodesia, by F. Eyles, Botanist.
No. 650. Coffee Culture in Southern Rhodesia, by G. W. Marshall, Horticulturist.
No. 651. Two Important Leguminous Crops: The Velvet Bean and Dolichos Bean, by C. Mainwaring, Agriculturist.
No. 656. Tractor Notes, by A. W. V. Crawley, M.E., F.G.S.
No. 657. Hay-making in Southern Rhodesia, by C. Mainwaring, Agriculturist.
No. 663. The Use of Fertilisers and Manures in Southern Rhodesia, by A. D. Husband, A.I.C., Chief Chemist.
No. 672. Hay-making in Rhodesia, by H. G. Mundy, Dip.Agric., F.L.S.
No. 674. Top Dressing of Maize against Stalk Borer, by H. C. Arnold.
No. 681. The Sunflower (Helianthus Annuus) (Revised), by S. D. Timson, M.C., Dip.Agric.

No. 684. Warning to Maize Growers : Maize for Export.
No. 685. Notes on Farm Practices at the Government Farm, Gwebi, by S. D. Timson, M.C., Dip.Agric.
No. 694. The Edible Canna (Canna Edulis), by D. E. McLoughlin.
No. 695. The Castor Oil Plant (Ricinus spp.), by S. D. Timson, M.C., Dip.Agric.
No. 697. Results of Analysis of Samples taken under the "Fertilisers, Farm Foods, Seeds and Pest Remedies Orrdinance" during the year 1927-28.
No. 700. Further Notes on Farm Practice at the Government Farm, Gwebi, by S. D. Timson, M.C., Dip.Agric.
No. 704. The Importance of Research on Pasture Improvement in Southern Rhodesia, by A. D. Husband, A.I.C., Chief Chemist.
No. 705. Suggested Cropping Programmes for Farms on the Sand Veld, by D. E. McLoughlin, Assistant Agriculturist.
No. 706. A Farmers' Calendar of Crop Sowings, by C. Mainwaring, Agriculturist.
No. 708. Witch Weed or Rooibloem (Striga Lutea)—a Serious Menace to Maize, by J. A. T. Walters, B.A., F.R.S.A., Agriculturist.
No. 709. Sand Veld Farming and its Possibilities, by E. D. Alvord, M.Sc. (Agr.).
No. 710. Monthly Reminders for the Farming Year, by the Division of the Chief Agriculturist.
No. 713. Ensilage, by J. A. T. Walters, B.A., Agriculturist.
No. 724. Ploughing by Tractor, by A. W. V. Crawley, M.E., F.G.S.
No. 727. Farmyard Manure, by A. P. Taylor, M.A., B.Sc., Agricultural Chemist.
No. 743. Sunn Hemp, by S. D. Timson, M.C., Dip.Agric.
No. 750. Cotton in Southern Rhodesia—Hints to Growers, by G. S. Cameron, Empire Cotton Growing Corporation.
No. 751. The Sweet Potato, by S. D. Timson, M.C., Dip.Agric. (Wye).
No. 757. Maize on the Sand Veld : Results at the Tobacco Experiment Station, Salisbury, by C. A. Kelsey-Harvey, Manager.
No. 758. Instructions for Taking Soil Samples. Issued by the Division of Chemistry.
No. 759. Witch Weed (Striga Lutea) : Methods of Control, by S. D. Timson, M.C., Dip.Agric. (Wye).
No. 762. The Value of Rock Phosphate and "Bone and Superphosphate" as Fertilisers for Maize Production, by A. D. Husband, Chief Chemist.
Botanical Specimens for Identification.
Maize Grading Regulations.
Accelerating the Sprouting of Potatoes.

REPORTS ON CROP EXPERIMENTS.

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Land Bank Act (price 1/-).
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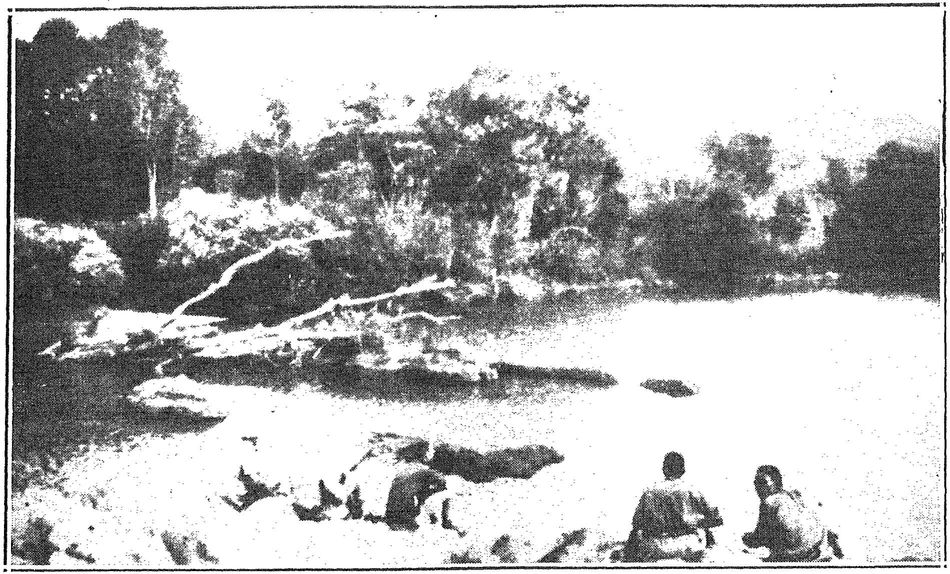

Hunyani River near the Zambesi escarpment.

THE RHODESIA

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Editorial.

Contributions and correspondence regarding subjects affecting the farming industry of Southern Rhodesia are invited. All communications regarding these matters and advertisements should be addressed to:—The Editor, Department of Agriculture, Salisbury.

Picturesque Rhodesia.—The photograph reproduced on the opposite page is typical of the river scenery of the Colony and demonstrates in a small way the picturesqueness of this land of our adoption. In the intimacy of environment we are apt to overlook the scenic beauties which surround us, but in its rugged grandeur, its sharp contrasts and its wonderful colour effects Southern Rhodesia presents features which are unique. Visitors are familiar with the Victoria Falls, the Sinoia Caves and Zimbabwe, but in their journeying to these famed spots they see little of the real Rhodesia. Only now, thanks to the construction of roads to the remoter districts and to the general use of motor transport, are many Rhodesians of long residence able to become acquainted with their country and to appreciate the natural beauties at hand. We foresee the day when, with the aid of better and more rapid transport facilities, Rhodesia will attract many visitors and reveal its charms to the world.

Humane Killing of Farm Live Stock.—We direct attention to the article which Lieut.-Col. E. Hope Carson has written for this issue of the Journal on the above subject. Instances have come to our notice where the killing of live stock has been accompanied by great suffering on the part of the animal, and invariably it has been found that the killing was left entirely to natives. Col. Hope Carson stresses the point very strongly that the killing of live stock should always be performed under white supervision, and should the "humane killer" not be available, that the rifle or revolver be used. Further, that the carcase should be bled immediately the animal is stunned. We do not possess any expert knowledge of the subject, but it appears to us that the methods advocated by Col. Hope Carson would obviate any unnecessary suffering by the animal, and we hope that what is written and the diagrams reproduced will be carefully studied by those who are responsible for the killing of farm live stock.

Export of Cattle from Southern Rhodesia.—From figures which we publish elsewhere in this issue of the Journal it will be seen that the number of cattle exported from the Colony during the past year was 73,615. This compares with the total of 71,429 for the previous year. The main increase has occurred in cattle exported overseas by the Imperial Cold Storage, the number for 1929 being 33,305, or 6,182 in excess of that for 1928. The number of cattle sent to Johannesburg for slaughter during 1929 was 7,214, compared with 10,369 in 1928, and to the Congo for slaughter 23,956, as compared with 26,833 in the previous year. Breeding cattle sent to the Congo in 1929 totalled 7,959, compared with 5,701 in 1928. We sent 306 head to Northern Rhodesia, as compared with 411 in 1928, and to Portuguese East Africa 146, as compared with 741 in 1928. Our export of slaughter cattle on the hoof to England numbered 695 in 1929, one small shipment being sent in April and the major one in May. In 1928 we sent 140 head to England.

Farming in Matabeleland.—We would particularly direct the attention of Matabeleland farmers to the report which we publish elsewhere in this issue of the Journal of the Bulawayo Municipal Demonstration Station for the seasons 1927-28 and 1928-29. As a result of the painstaking work which has been carried on at this station during the past eight years, farmers have at their disposal data of the greatest value which it is hoped will be put to practical use. One striking statement in the report is to the effect that green manuring with a legume, aided by a light dressing of phosphatic fertiliser, has been found to be fully as efficacious as an application of farm manure at the rate of seven tons per acre. Supplies of farm manure are seldom available in anything like sufficient quantity for the needs of the average farm, and the significance of this statement will be realised by farmers throughout the Colony. Then the fact elucidated by trials that the standard white dent varieties of maize consistently give better yields than acclimatised strains of yellow and white flints should especially be noted.

Other crops reported upon in addition to maize are ground nuts, legumes for grain, crops for hay or fodder, sweet potatoes, silage and succulent crops and potatoes. It will be seen from the tables printed that few total failures are recorded, while in an average season excellent yields have been obtained. The report provides an admirable object lesson of the results that can be obtained by the adaptation of modern farming methods to local conditions, and we trust it will encourage the farmers of Matabeleland to broaden the scope of their farming practice.

Sericulture.—The Colony is receiving a visit from Mr. N. Breton, who will advise the Government as to the possibility or otherwise of establishing sericulture on a commercial scale. Mr. Breton is chairman of the advisory committee on silk production to the Imperial Institute, and he has already visited Tanganyika, Uganda and Nyasaland on a like mission. Upon the completion of his task in Southern Rhodesia Mr. Breton will proceed to the Union of South Africa to advise the Government there similarly. During the course of his investigations in this Colony Mr. Breton

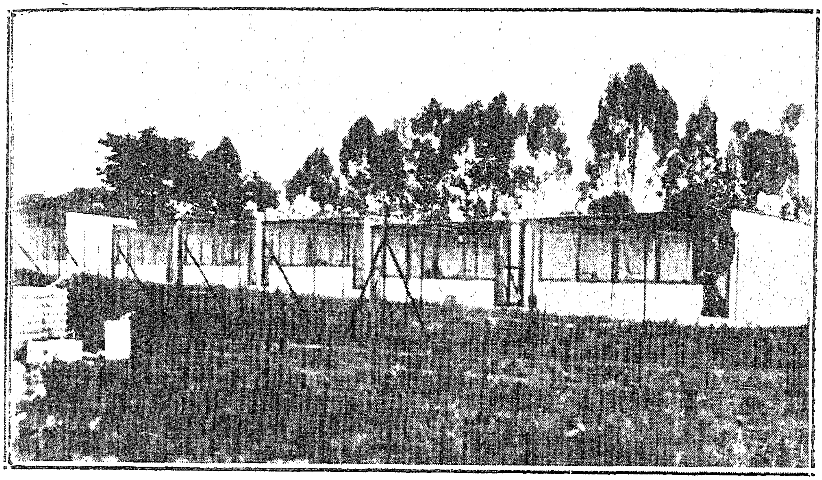
will address meetings of farmers at Salisbury, Umtali, Fort Victoria, Umvuma, Gwelo and Bulawayo, and will inspect a number of missions in various parts of the Colony.

Beyond the small experiment initiated by Colonel Frank Johnson, sericulture has received little attention in Southern Rhodesia, and it remains to be shown whether the cult of the silk worm is a practical economic proposition for the European farmer or the native to undertake. We know, of course, that silk worms have been reared successfully here and that cocoons sent by Colonel Johnson to the Imperial Institute were favourably reported upon; also that a very fine piece of brocade was manufactured therefrom. We know little, however, as to the economic possibilities of commercial sericulture in Southern Rhodesia, and this is a point upon which we seek enlightenment from Mr. Breton. In other countries sericulture is, of course, a peasant industry, and the profit to the individual is small. In Japan, however, sericulture is a national industry, and about 80 per cent. of the world's exports of silk are from that country.

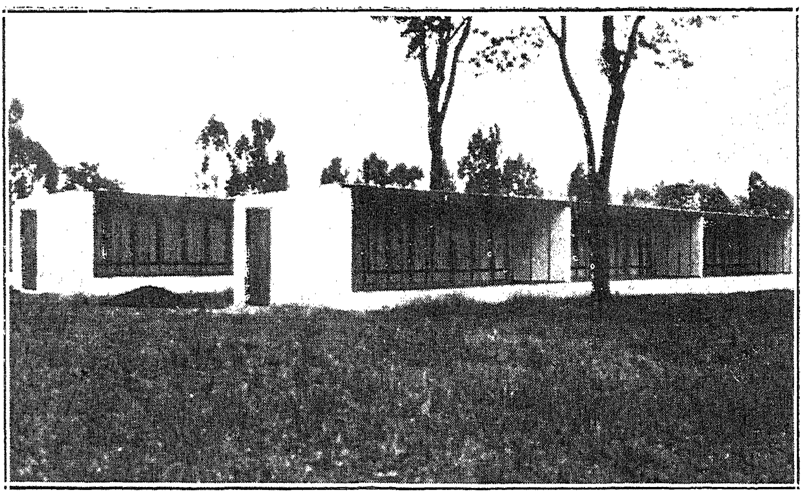
Mr. Breton expects to stay in the Colony about a month, and we have no doubt that at the end of this period he will be in a position to advise the Government authoritatively on the subject he is investigating.

Government Demonstration and Experimental Poultry Station.—Construction work on this station, to which reference was made in the July issue of the *Rhodesia Agricultural Journal*, is completed, and there is now available an up-to-date and well-equipped plant for the work to be undertaken. The site of the station is adjacent to the agricultural laboratories at Salisbury, and the area has been systematically laid out and sub-divided to accommodate a semi-intensive breeding and commercial poultry plant and an extended egg-laying test. Next year it is hoped to erect suitable buildings to enable a system of intensive poultry keeping to be carried on. Under this system the birds are kept in close confinement and maintained in a healthy and profitable condition.

In pursuance of the demonstration work to be undertaken, Black and White Leghorns, Austral-Orps, Light Sussex, Rhode Island Reds and Anconas have been acquired



Breeding pens at Government Poultry Demonstration Station, Salisbury.



Part of the egg-laying test pens, Government Poultry Demonstration Station, Salisbury.

and are now installed in their new quarters. These birds will be used for feeding and fecundity trials and generally for demonstrating good methods of poultry rearing. Ducks of various breeds will also be kept.

The birds to participate in the eleventh Southern Rhodesia egg-laying test, which commences on the 1st March, will be housed in the buildings shown in the illustration on the opposite page. These buildings, of which the illustration shows part, are capable of accommodating 200 birds. Each bird will be penned separately, the floor space allotted being 16 square feet, and the buildings and equipment are designed to give the greatest comfort to the inmates.

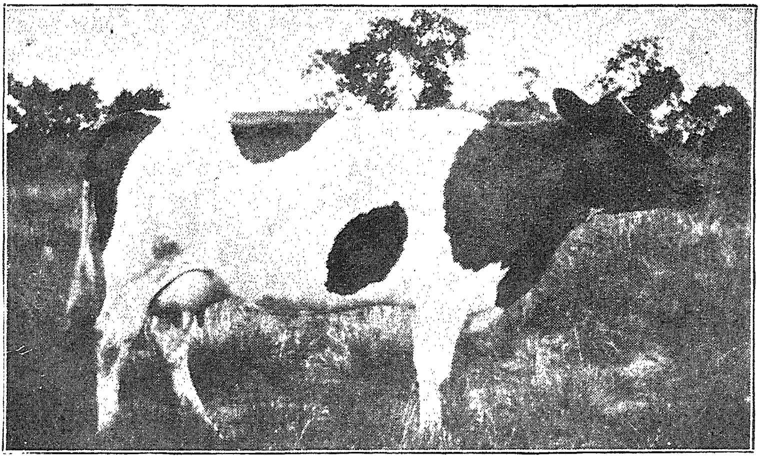
The establishment of this station is an indication of the growing importance of the poultry industry and evidence of the desire of the Government to foster and encourage it in every way possible. Poultry keepers are invited to inspect the station, and every facility will be afforded them of obtaining first hand information as to the methods in vogue.

Rhodesian Dairy Stock.—The breeding of dairy stock until recent years has not generally received sufficient attention, but it is interesting to note that "The South African Friesland Journal" has paid Mr. J. S. Struthers, Palm Tree, Sinoia, the signal compliment of publishing in its pages a photograph, reproduced in this issue, of a cow of his own breeding, "Palm Tree Gem," with the endorsement, "A beautiful cow registered on inspection from the appendix section of the herd book." Mr. Struthers has occupied his farm since 1909, and in that year, and again in 1911, he imported some Friesland grade stock from the Cape. In 1913 he commenced keeping records by weighing the milk produced on one day in the week and multiplying the weights produced by seven. This represented the average weekly production of each cow. He purchased a Babcock Tester in 1916, and found that the variations in butter fat caused by the practice of allowing the calves to suckle were so great that he abandoned this practice during the course of the next season and began to hand-rear his heifer calves. This he found so satisfactory that he has continued this practice, so frequently advocated in these pages, until the present time.

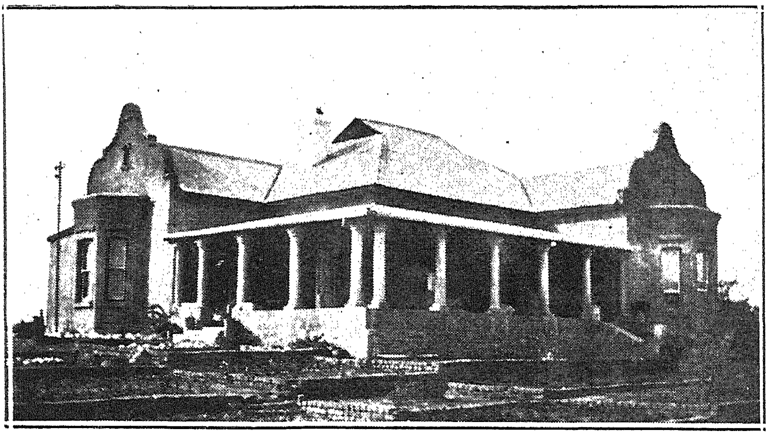
He also made the interesting discovery that certain families produced milk of a high testing quality, and by means of selection he has raised the average butter fat production of his herd to a very high figure. On a recent visit of the milk recorder this official found that the average butter fat percentage of the milk of six cows tested over a period of 48 hours reached the very high percentage of 4.43. This, of course, is most exceptional for milk from Friesland cows and shows what can be achieved by systematic recording and selection. The family from which "Palm Tree Gem" has sprung has also the supreme merit of being regular breeders. Mr. Struthers supplies the following information as to the breeding of this cow: "Lilly" calved 13th September, 1911; had 11 calves—8 females, 3 males. One of her daughters was "Corral," which had 8 calves in 9 years. She had a daughter, "Palm Tree Pearl," which also had 8 calves in 9 years. Her daughter, "Palm Tree Gem," the subject of our illustration, had 6 calves in 7 years 6 months.

The Army Worm Invasion.—The present invasion of army worm is by far the most widespread that has occurred during the past twenty years. Reports of damage have been received from the following districts:—Umtali, Makoni, Marandellas, Salisbury, Mazoe, Lomagundi, Hartley, Gwelo and Victoria. In other words, the outbreak covers the whole of the maize-growing area. It is impossible to estimate the losses as yet, but undoubtedly they have been very severe, and in certain individual cases are not far short of ruinous.

At the commencement of the outbreak there was a large supply of locust poison on hand at Salisbury—sufficient to meet the demand created by several outbreaks as experienced in the past. This poison has been supplied to the public by the Government at the reduced rate of 2s. 6d. per gallon, and pumps have been issued on loan. In response to urgent calls, and even in anticipation of such calls, lorries have been despatched to several districts with supplies. Within two days of the outbreak being reported it was evident that the supplies of locust poison at Salisbury might be insufficient to meet the demand, and steps were immediately taken to obtain further supplies from Bulawayo, special arrange-



"Palm Tree Gem," bred by Mr. J. S. Struthers, Sinoia.



Mr. J. S. Struthers' house at Palm Tree Grove, Sinoia.

ments being made with the railway management so that the first consignment could come forward by mail train. Unfortunately the engine of this train was derailed at Somabula, and although the passengers were transhipped, the poison was left behind. This occasioned about twenty-four hours' delay in meeting the needs of certain farmers and districts. Special officers were seconded to the Entomological Branch to assist in dealing with the demand for supplies.

It is not necessary here to deal with the life history of the insect, but it may be stated that much remains to be learnt concerning the cause of these outbreaks. The only theory which appears to fit observed facts is that the moths are migratory and cover big distances before stopping to lay their eggs. In the records of the Department there have never been two serious outbreaks of this pest in any one season, nor have two consecutive broods apparently been reared in any one locality, notwithstanding the fact that it was proved that moths emerged in very large numbers. It should be pointed out that from a first brood of caterpillars occurring in December or early January, a second brood would normally occur in February.

Whilst the growth of the caterpillar from the egg to the time when it enters the earth to pupate occupies not far short of three weeks and several batches of eggs are laid by the females, in this way furnishing caterpillars of different ages, it is the usual experience that outbreaks do not last much beyond ten days to a fortnight after the caterpillars are first noticed. The reason of this is not quite clear, but in actual fact the more backward caterpillars do not seem to thrive as well as the forward ones.

It is to be noted that the above remarks are to be taken rather as a record of experience than as a prophecy, and while we can only judge what is likely to happen from experience, insect pests have a way at times of springing surprises. Therefore, although from experience one would consider there is no danger of a further outbreak during the present season, this must not be taken as a definite statement that such is impossible.

Sand Veld Experiment Farm.—There has long been an urgent need for a sand veld experiment farm in Southern Rhodesia in which a large proportion of the soil is of this type. The matter has figured on the agenda of numerous congresses of the Rhodesia Agricultural Union, and resolutions requesting the Government to establish such a station have from time to time been passed. The necessity of acquiring information as to the capabilities of the granitic soils was recognised by the late Administration, and prior to the war there was a sand veld experiment station at Lochard, in Matabeleland, where a variety of fodder crops and maize and summer and winter cereals were tried. This station was closed down in 1915, and subsequently experiments of a similar nature were carried out on the Arlington Estate, near Salisbury, conjointly by the Department of Agriculture and the late owner of that estate. The work could not be carried to a conclusion, and although certain valuable data were obtained the station was closed down after eighteen months.

For the last five years general experimental work on the sand veld has been carried out on the Tobacco Experiment Station near Salisbury, and here again very convincing evidence of the potentialities of the granite areas for crops other than tobacco and for dairying has been obtained. The field for investigation, however, is a very wide one, and this station is limited in the facilities which it offers for the research work required.

The Government has now acquired approximately 3,000 acres on the Lendy Estate, bordered by the railway line on one side and the Marandellas-Watershed Road on the other, and about four miles from the station and village of Marandellas. Here experiments will be carried out under three main headings, viz.: (1) tobacco research, (2) general crops and live stock, and (3) pasture improvement. The programme of work has not yet been definitely drawn up, but we can indicate some of the lines upon which the investigations will proceed. As regards tobacco, plant breeding will figure prominently in the programme and research work will be undertaken with a view to producing the type of leaf particularly required by the manufacturer. Spacing, priming, topping and suckering trials will be made, and, *inter*

alia, such intricate matters as the influence of fertilisers and manurial treatment upon the yield, body, texture and burning quality of the leaf will be investigated, and its chemical properties studied. Data will also be collected as to the best methods of curing, conditioning, bulking and packing tobacco for export, and for the control of plant diseases and insect pests.

On the general farm a considerable area of both high-lying ridge land and vlei soil will be set aside for experimental work on small plots, and on these areas field crop, manurial, fertiliser, rotation and green manuring experiments will be carried out in the same exhaustive manner as has been done for the heavier red soils of the Colony on the Salisbury Experiment Station. A resident experimentalist will be in charge of this work.

A plant breeder will also probably be stationed on the farm to undertake systematic plant breeding with tobacco and wheat and with other crops as time permits.

Simultaneously considerable areas of arable and pasture land will be farmed as a commercial sand veld proposition, in order to demonstrate the possibilities of mixed farming on this type of land. These large-scale operations will include both summer crops and winter cereals on vlei land without irrigation. It is also hoped before long to place a small acreage of land under irrigation.

Live stock of different kinds will be introduced on to the farm as soon as the progress of development warrants this course, and amongst this stock it is anticipated that sheep will be included as soon as the circumstances warrant. In this connection systematic work will be undertaken in the improvement of the pasturage by the establishment of selected grasses of the better kinds and also by the introduction of different varieties of clovers into the cool, damp soils of the vleis.

About 500 acres of the poorest grazing land will be laid off in paddocks for pasture improvement experiments. The object of this work is to determine the influence of various methods of soil treatment on the chemical and botanical composition of the veld herbage, and on the rate of growth and productivity of grazing animals. It is fully realised that,

compared with cultivated pastures in Great Britain and in many other parts of Europe, our veld grasses are deficient in many respects, and it is desired to ascertain by what methods it is possible to correct these deficiencies.

Preliminary work carried out at the Salisbury Experiment Station has already shown that by fertiliser treatment it is possible to increase considerably the yield of grass and at the same time to alter its chemical composition, but the extent to which this method of soil treatment is economic has yet to be determined. There is very little doubt that by many simple methods of veld management, such as controlled grazing, clearing of small bush and the cutting of grass for hay at the correct season of the year, the carrying capacity of our veld and its feeding value to stock can be considerably increased.

Experimental work of this nature has already been commenced at Matopos, and it is hoped to duplicate this work at Lendy and possibly extend its scope.

It should be mentioned that the Empire Marketing Board is contributing £ for £ towards the expense of this investigation.

Dark Fire-cured Tobacco.

FIELD OPERATIONS.

By D. D. Brown, Chief Tobacco Expert.

The dark fire-cured type of tobacco is the most recently introduced addition to the number of types of tobacco now being produced in Southern Rhodesia.

The first recorded instance of this method of curing being adopted in this Colony was in the 1924-25 season, on Idaho Farm, Hartley district. The collection of data concerning the production of fire-cured tobacco under local conditions, therefore, does not extend over any lengthy period.

It is possible that some modification in the following recommendations may, in the light of further experience, become advisable during the course of future years. Several of the factors which are liable to remain constant, however, include the selection of suitable soils, careful handling and the maintenance of a high standard of quality.

Climatic Conditions.—For the production of fire-cured tobacco of good quality a moderate rainfall is required, and the rain should be well distributed throughout the growing season—precipitation in gentle showers is more beneficial than heavy downpours. The rainfall should be light during the ripening and harvesting period. During the transplanting season the most desirable weather conditions are dull, misty days with frequent showers of rain. As soon as the transplants are established in the field, sunshine is essential to accelerate growth.

From the time the plants have taken root in the field right up to the harvesting a full measure of sunshine is needed to assist in the proper development of the leaf.

When the rains are properly distributed throughout the season a normal rainfall of 25 to 30 inches is sufficient for the production of fire-cured tobacco, and if extreme weather conditions should prevail a drought is preferable to an excessively wet season. In dry seasons much can be done to conserve soil moisture by thorough tillage operations carried out at frequent intervals.

Soils.—The greatest care must be exercised in the selection of soils designed for the production of this type of tobacco. The class of soil to be preferred is a friable loam of good inherent fertility. The soils derived from diorite, dolerite, schist or banded ironstone are usually red in colour and may generally be classed as clay loams. These soils are mostly fertile and, provided they contain a high percentage of clay, silt and humus, are suitable for fire-cured tobacco. Certain alluvial soils will also produce good crops of dark fired tobacco.

When selecting land for the crop due attention must also be given to the nature of the sub-soil. The character of the sub-soil has an important influence on the yield and quality of the tobacco leaf grown on any type of land. If the sub-soil is impervious the plants will, in certain seasons, suffer damage through the land becoming water-logged. Should the sub-soil, on the other hand, be very porous, the tobacco may suffer from drought in seasons of light rainfall. Soil underlain by a very porous sub-soil will also not be sufficiently retentive of artificial fertiliser. The most common type of sub-soil found underlying the soils suitable for fire-cured tobacco is somewhat similar to the surface soil, with the exception that it contains a greater percentage of clay, is close textured, stiffer, varies in colour and may either contain a mixture of gravel or be divided from the surface soil by a layer of coarse rubble.

If possible the crop should not be planted out on virgin soil, but preferably on soil which has been previously cropped. Worn out lands must be avoided, as they are not conducive to proper growth and development of the crop. The land usually favoured in this Colony is that which has been planted to maize in former seasons, and, provided the fertility of the soil has not become exhausted, this has generally given satisfactory results.

Preparation of the Land.—It is essential that after transplanting, the plants should make rapid and continuous growth; it is therefore important that the field be properly prepared and brought into as perfect a tilth as possible. The land should be ploughed as soon after the harvesting of the previous crop as possible, so that a certain amount of soil moisture may be conserved and insect pests, which may be hibernating in the soil, may be destroyed. The field should be ploughed again during the early part of the following season, and brought into good tilth just prior to planting.

In the case of all land that has been planted with a green manuring crop preparatory to producing fire-cured tobacco, it is desirable that the leguminous crop be turned under while the soil still contains sufficient moisture to cause ready decomposition of vegetation, and convert it into humus. Soil thus treated is rendered more friable and retentive of moisture. After lying fallow during the winter months the land should be ploughed and cross-ploughed, then harrowed with a heavy disc harrow, being finally reduced to a good tilth by means of drag harrows. Whenever possible the final ploughing and harrowing should be made when the soil has been moistened by showers of rain which fall at the commencement of the wet season, since any weeds germinating at this time will thus be destroyed and subsequent cultivation and weeding will be reduced accordingly.

In the event of fertilisers being applied broadcast, this operation is carried out after the final ploughing and just prior to the last disc harrowing. Finally the field is ridged by means of a ridging plough. The ridges should be broad at the base and flat on top, as this encourages a better balanced root system than a narrow ridge with sharp apex. Narrow and steep ridges are also more liable to be beaten down by heavy rain storms and cause a certain degree of soil erosion. The spacing between the ridges should be from 3 feet 6 inches to 4 feet, according to the type of soil. If possible, the ridges should run east to west, so that the plants will receive the maximum amount of available sunlight. In this matter, however, the contour of the field will be the deciding factor. Ridges should be aligned so as to follow the natural drainage slope of the field. Should the land be steeply sloping it is best to form the ridges

diagonally across the slope, in order to check the velocity of water running between each ridge after rain storms.

Suitable drains should be made where necessary to divert storm water. Around each field a strip of ground (say 20 feet wide), kept free from weeds and grass, will assist in checking the intrusion of insect pests. The outside edges of the field should be straight, and suitable pathways made at convenient intervals across the field, by means of which a good deal of time and damage will be saved during the working of the crop.

Manurial Treatment.—Until exhaustive experiments have been made in the fertilising of each type of soil used for tobacco culture, it is not possible to set down any definite rules on this subject. Owing to the diversity of the types of soils, their varying degrees of inherent fertility and lack of uniform treatment in regard to tillage and cropping, it is only possible to deal with the fertilising of the crop in a general sense.

In order to secure good yields of desirable quality leaf a properly balanced supply of plant food must be available. A complete fertiliser contains nitrogen, phosphoric oxide and potash; each element has a particular effect on the production and quality of the leaf. Nitrogen hastens and increases leaf growth in all plants. The use of nitrogen for tobacco adds size and body to the leaf, thereby increasing the yield. It should, however, be used in the correct proportion to derive the greatest benefit from its use. An insufficiency of nitrogen causes the production of small leaves lacking in body, while an excess of nitrogen makes large midribs and fibres, delays maturity, renders the leaf dark in colour and creates a tendency to disease in bad seasons.

Mathewson* states that "too much nitrogen, especially if unsupported by a sufficiency of other fertilising compounds, particularly phosphates, will make the tobacco coarse, dark and late in maturing, with a tendency to damage by 'red fire' or dead spots here and there on the leaves."

Potash aids in leaf production, assists the health of plants, and, in the form of sulphate, nitrate or carbonate,

* E. H. Mathewson, Bulletin No. 16, U.S.A. Department of Agriculture.

Plant in foreground showing good leaf development.

improves body, texture and burning qualities of the tobacco. Muriate of potash has a deleterious effect on the combustibility of the cured leaf, and for this reason is not recommended to be used as the sole potash supplying ingredient in a tobacco fertiliser mixture. If an excess of muriate has been used as one of the sources of potash, the tips of the leaf are liable to turn yellow, the yellowness extending also down the lamina toward the base of the leaf. On young plants the effects are shown by brittleness and the edges of the leaves curling upwards. The use of muriate tends to make a smoother leaf when the tobacco reaches maturity and renders the cured leaf more retentive of moisture. It has been generally accepted that while the yield, smoothness, general texture and water-holding propensities of the leaf may be improved by the application of muriate of potash as a fertiliser, not more than one-third of the potash should be supplied in the form of muriate. Phosphates hasten maturity, which is especially desirable in the production of dark fire-cured tobacco. The application of phosphates also increases the yield and improves the quality and colour of the leaf. On soils which have a low nitrogen content phosphate must be used with discretion, as excessive applications may cause premature ripening or "firing" of the leaf, especially during seasons of drought. Where "kraal" manure has been applied or a leguminous crop has been turned under, and there is an accumulation of nitrogenous matter, a liberal dressing of phosphates will prove beneficial.

The quantity of fertiliser to be applied per acre depends upon the inherent fertility of the soil and upon the proportions of the several elements of plant food used in the fertilising mixture. It is false economy to apply light dressings of fertiliser, for the plants in this instance may get a good start, but there may not be sufficient plant food available to produce a normal yield of tobacco. An insufficiency of fertiliser tends to produce plants on which the leaves are under-sized and lacking in body and quality. Detrimental effects are also caused by too liberal an application of fertilisers. In this instance it induces a coarse, rank growth of leaf, which is generally late in maturing, difficult to cure and of indifferent quality. Tobacco of this nature is usually

more susceptible to attack by bacterial and fungoid diseases, when such are prevalent.

The rate of application per acre must be governed by the actual deficiencies in the soil, and under these circumstances the fertiliser dressing will not be constant throughout any given area or possibly even on any given farm within the area. So far as present experience obtains, it has been found that an application of from 600 lbs. to 1,000 lbs. per acre will produce satisfactory results, the formula of the fertiliser used being a 12-6-8 mixture, the water-soluble components of which are as follows:—

Phosphoric Oxide	12 per cent.
Nitrogen	6 ,, ,,
Potash	8 ,, ,,

The nitrogen is derived from combined organic and chemical sources, while the potash requirements are supplied in a combination of sulphate and muriate of potash.

Suitable proprietary brands of fertilisers procurable from local agents may be used, or special mixtures can be made to order in the factories or mixed on the farm.

Kraal manure provides an excellent source of manurial treatment and should be applied broadcast, well in advance of the planting season, at the rate of 5 to 10 tons per acre. When kraal manure is used a supplementary dressing of superphosphate must also be applied at the rate of from 200 lbs. to 400 lbs. per acre, the phosphates being supplied in a mixture of bone meal and superphosphate in the proportion of one-third bone meal to two-thirds high grade superphosphate.

Rotation of Crops.—The proper management of the soil demands a rotation of crops. When any one crop is grown continuously, season after season, on the same field, it naturally follows that, besides not being cropped to the best advantage, this method of farming does not aid in the lessening of insect pests and diseases attacking the particular crop grown. Suitable rotations are largely determined by soil, climatic and marketing conditions, while the question of insect pests and diseases has also to be considered.

The frequency of cash crops, green manuring crops and market conditions can only be decided upon by the farmer himself, as he alone is fully conversant with the amount of capital available and the time and capital which can best be spared in building up the fertility of his land. An ideal rotation scheme suited to all crop requirements and climatic conditions has not yet been evolved, and until such time as more suitable crop rotations have been established through exhaustive experiments the continuance of any rotation schemes giving satisfactory results in present use is recommended. Where no such system is in force and local data are not available, it is recommended that a rotation somewhat on the following lines be adopted:—

1st year	Tobacco.
2nd year	Maize.
3rd year	Cotton.
4th year	Legume—ploughed under.

Some other crop, such as ground nuts, may, if desired, be substituted for cotton in the third year of the rotation period. For the leguminous crop to be ploughed under a selection is offered by velvet bean, dolichos bean, Sunn hemp or Niger oil.

In the case of cultivated land which has not recently had a green crop ploughed under, it would be advisable to precede the first crop of tobacco by a preparatory treatment with a leguminous crop, after which, the four years course could be maintained.

Time for Transplanting.—When the seedlings are about six inches in height, they are ready for transplanting. Tobacco of desirable quality is rarely produced from unsuitable plants, and the yield in most instances is disappointing. Tobacco seedlings which are less than four inches in height are sometimes used; these are too small and fail to make satisfactory growth unless the weather conditions are particularly suitable. A few hours of hot sunshine immediately after transplanting will either kill or seriously retard the growth of such small plants, while a heavy rainstorm may cause them to become buried in the soil.

On the other hand, overgrown, tough and woody seedlings are often planted in order to complete the intended

acreage. This class of seedling, as a rule, does not make satisfactory growth; the flower head develops while the plant is still small, and, after topping, the leaves remain undersized and do not ripen normally. Optimum results can hardly be expected unless the tobacco is transplanted during the most favourable portion of the season. The best time for transplanting fire-cured tobacco is generally from the beginning until the end of January, as the leaf will then reach maturity after the heavy rains have normally ceased. It is essential that the tobacco should reach maturity before the weather becomes too cold; therefore, in those areas where the advent of cold weather may be expected earlier than in the warmer parts of the Colony, the date of transplanting must be modified accordingly.

A similar adjustment is required where the only available land is of a type which causes retarded maturity in the plants.

Transplanting.—Transplanting is best done on dull, misty days, with frequent showers of rain, and every opportunity of transplanting the crop during favourable weather should be fully utilised. It is seldom, however, that the whole of the crop can be transplanted under ideal conditions; the planting operations more often than not are controlled by the advent of rain, frequently in the form of local showers, and the moisture already present in the soil. It is not advisable to transplant tobacco unless the soil contains sufficient moisture to prevent excessive wilting of the transplants.

Provided the soil is sufficiently moist, tobacco may be transplanted throughout the day, though the best time is during the afternoon, as the plants are then subjected to less intense heat immediately after being set out in the field. The seedlings are transplanted at regular intervals along the top of each ridge. The plants are usually spaced from three to four feet apart. A short, pointed stick is used in making suitable holes for the reception of the seedlings, which are then carefully inserted and the soil around each plant firmly pressed down. The holes made to receive the plants should be large enough to admit the roots, but should not be more than the required depth. The tap root

A crop of tobacco suitable for fire-curing.

Field of tobacco in Gwelo area intended for fire-curing destroyed by frost in April, 1926.

An excellent field of heavy tobacco, Gwelo area, but topped much too high.

should not be bent upwards when the plant is put into the ground. Care must also be taken that the heart of the plant is not buried beneath the surface of the soil.

Cultivation.—As soon as the young plants have become established in the field cultivation should commence. The first cultivation is shallow, so that the plants will not be disturbed. When the plants begin to grow properly a deeper cultivation should be given, in order to stir up and aerate the soil. Subsequent cultivation should be shallow. When planted on ridges this operation is best made by the alternate use of a wing-shovel plough and the ordinary cultivator; hand hoes should be used between the plants in the row. Thorough cultivation plays a very important part in determining the ultimate quality of the leaf produced. The crop should therefore be cultivated as often as possible in order to keep the field free from weeds, maintain a good soil mulch and stimulate the growth of the plants. Cultivation with animal-drawn implements ceases when the plants are so large that the leaves are liable to become damaged. Further cultivation should, if necessary, be done by hand hoeing.

Priming.—The removal of surplus leaves from the lower portion of the plant is described as "priming." When the plants are about twelve inches high the first priming should take place. Diseased or damaged leaves should not be left at the bottom of the plants. The final priming of the tobacco is made when the plants have reached the correct stage for topping. The object of priming is to conserve plant energy and to increase the development of the remaining leaves. The sand leaves or "lugs" are of little or no commercial value, and if left on the plant are liable to induce white mould and provide cover for insect pests. The plants should be primed so that the lowest leaves left remaining on the plant hang well clear of the ground. All discarded leaves are best carted off the field when disease is suspected to be present, or even as a precautionary measure when no disease is apparent.

Topping and Suckering.—In "topping," the terminal bud is removed from the plant to prevent the development of seed and to force the maximum development of good sized leaf. The exact number of leaves which should be left on

the plant cannot be definitely stated, but each plant must be treated as a unit and topped according to its merits. The correct number of leaves to each plant will be the number which it can carry to full development and maturity. When suitably topped the plant will produce upper leaves almost the same size as those growing lower down the stalk.

The upper leaves of plants which are forced to carry too many leaves are very small and late in maturing; on the other hand, if too few leaves are left on the plant they become coarse, rough, lifeless, prone to disease and are late in maturing, besides being difficult to cure. Both experience and judgment are required in this operation, but as a guide it may be stated that the height of topping dark fire-cured tobacco is usually eight leaves. A common mistake is made by delaying the topping beyond the time for maximum benefit to accure. This is wasteful of plant food and energy, the stalk of the plant becomes hard as the flower head develops and the operation of topping is rendered more difficult. The proper time to top tobacco is when the requisite number of leaves have developed and while the stem of the plant is still soft and supple. The portion of the plant to be removed should be bent over towards that side of the plant where the lowest of the three top leaves is found; this will obviate damaged top leaves.

Shortly after topping, "suckers" will appear in the axils of the leaves. Sucker growth is rapid and they must be removed or the whole object of topping will be defeated. One necessary precaution worthy of attention during all operations concerning priming, topping and suckering is the division of the labour gang into two sections, one to deal only with clean, healthy plants, and the other to follow after and attend to those plants affected by mosaic or other diseases which may be present at the time.

In conclusion, it may be stated that the acreage planted should not be in excess of the barn accommodation available, otherwise there exists a very great incentive to overcrowding and bad handling of the tobacco after it is harvested. The relative acreage to barn space is roughly in the ratio of 5 acres to each barn—25 feet by 16 feet by 17 feet high, or other internal dimensions which will provide the same cubic capacity.

The primary object should be the production of quality rather than quantity, and to this end intensive rather than extensive cultivation should be the policy adopted. It must also be fully realised that only the type of tobacco for which the soil is best suited should be grown. Climatic conditions also are important in determining the class of tobacco which will be produced. It is advisable, therefore, to prove the suitability of the local soil and climatic conditions before embarking upon the cultivation of dark fire-cured tobacco on a commercial scale in a district or on a farm where this type of tobacco has not been previously tried and proved successful.

SUMMARY.

(1) Exercise good care in the selection of land.

(2) Examine the sub-soil as well as the surface soil.

(3) Break up the land at the proper time and conserve soil moisture.

(4) Secure a good tilth before the crop is planted; this cannot be achieved after the tobacco is established in the field.

(5) Broadcast kraal manure well in advance of the planting season; it will then be properly incorporated with the soil.

(6) Have the ridges broad, flat-topped and properly aligned.

(7) Put in storm water drains where necessary and minimise soil erosion.

(8) Practise crop rotation and maintain soil fertility.

(9) Do not use unsuitable seedlings.

(10) Cultivate the crop at frequent intervals.

(11) Prime the plants when necessary and discard sand leaves and those which are diseased.

(12) Top each plant at the proper height for maximum development of leaf.

(13) Remove "suckers" at frequent intervals.

(14) Do not plant an acreage in excess of the available barn accommodation.

(15) Endeavour to maintain a high standard of quality and reduce the production of inferior tobacco to the lowest possible degree.

Notes from the Veterinary Laboratory.

By Ll. E. W. Bevan, M.R.C.V.S.,
Director of Veterinary Research.

"That our garners may be full, affording all manner of store; that our sheep may bring forth thousands and tens of thousands in our streets. That our oxen may be strong to labour; that there be no breaking in, nor going out; that there be no complaining in our streets."—Psalm 144.

Agriculture in Southern Rhodesia is, at the moment, somewhat under a cloud. The pastoral industry appears to present the "silver lining." There is much complaining. But since the "early days" the agriculturist in this country has had to contend against fearful odds. Rinderpest, rebellion, rabies, lung-sickness, East Coast Fever, red-water, gall-sickness, infectious abortion, quarter-evil and innumerable other diseases have been sent to try him, but have failed to break him. He has weathered the storm, and with manly independence will no doubt continue to do so. Not by burying his head in the sand, but by looking facts squarely in the face and making the best of things.

In less progressive countries plague, pestilence and famine were regarded as "acts of God," and it was considered impious to endeavour to arrest them. Not so in this country, where it is recognised that "God helps those who help themselves," and the Veterinary Department helps those that do not. Too often in the past diseases have swept this country unchecked because they were not recognised or understood. This should never happen again if a scientific and practical knowledge of those diseases which exist and which may invade the country is obtained. It is only upon a sound foundation of such knowledge that the pastoral industry can progress and the Utopia of the psalmist be attained.

Comparative Pathology.—In the past the study of disease has been largely carried out in what may be called "water-tight compartments." The exponent of human medicine has concerned himself only with the ailments of man, and has at times exhibited a lofty contempt for the veterinarian who has confined his attention to his more humble patients. The student of plant diseases has made his observations without reference to either. Pasteur, whose contributions to the knowledge of disease revolutionised the medical world, was a chemist, and his entrance into the realms of pathology was deeply resented and strenuously opposed by the "medical men" of his day. Even now a certain exclusiveness is shown by those whose knowledge is confined to one branch of the subject towards those who practise the science and art of medicine and surgery in another. Such an attitude is as lamentable as it is ignorant. The exalted should remember the old adage, "Even the village idiot may direct one to the inn."

It is difficult to define "disease" except in terms of health. That is to say, "health is that condition of structure and function which on examination of a large number of individuals is found to be the common or prevailing one. Disease is any deviation from the healthy or normal in respect of structure, chemical composition or function" (M'Fadyean). A knowledge of disease, therefore, requires first of all a proper appreciation of the healthy or normal, and this can only be acquired by careful study of a considerable number of individuals. Nor should this be confined to a number of individuals of one species; it should include specimens of a number of species. Similarly, before one can study pathology one must realise in what manner the functions of the body are normally performed. In other words, the difference between physiology and pathology, the normal and the abnormal, is not so great as would be supposed. Every student of medicine has first to study biology, the science of living organisms, their structure, life, growth and actions. This gives him a knowledge of evolution and helps him to understand the miraculous changes which take place in the development of the human fœtus. His course of instruction includes the dissection of the earthworm, the crayfish, the frog and a veritable menagerie of animals. His physiology—that is, the science which treats

of the functions of the living organism and its parts—is learnt by many experiments upon animals. For example, the application of an electric cathode to certain areas of the monkey's brain helps him to understand, in later days, the noises and antics of his human patients. The study of the circulation in the web of the frog's foot has revealed many mysteries and solved many problems. Every veterinary student learns anatomy by dissecting the horse, the ox, the dog and the pig. By comparison with the latter in an upright position, the study of human anatomy is considerably simplified.

There are some, no doubt, who regard the animal body as made up of solid bones surrounded by a pultaceous substance moulded into certain tissues, muscles, liver, brain and so on. They would be surprised to learn that each and every one of these is composed of myriads of carefully constructed cells, beautifully laid down, each in relation to the other and often in pattern which when seen magnified under the microscope surpasses in beauty the most delicate mosaic. A microscopic section of the liver of an animal is almost indistinguishable from that of an agriculturist. It is not so much a matter for astonishment that sometimes this orderly arrangement is disturbed as that it has ever been achieved and that it ever functions correctly. That it is the common or normal in the vast majority of animals is far more remarkable. Man is indeed fearfully and wonderfully made, but so also is the animal. The study of the animal gives a more correct understanding of the mysteries of man. There are many abnormalities of the lower animals which, when studied, offer an explanation for the conditions of man which are called disease. There are many diseases of animals which are similar to those in man and many communicable from one to the other. Let us consider a few of them. Take, for example, cancer, the dread scourge of modern civilisation. What is cancer? Nothing more or less than a "cell run riot," some disarrangement of that orderly artistic design which has just been compared to a mosaic. Some aberrant cell, possibly an honest cell, one doing its job, obsessed by the idea that it must work harder, runs amok, preys upon its neighbour, requires nourishment and obtains it at the expense of its more orderly confreres. Thus it becomes para-

sitic and lives and flourishes at the expense of the cell community, over which it gains the ascendancy and which it ultimately destroys. Cancers are not the monopoly of man; they are found throughout the animal world. Mice are subject to cancer, which can be produced in them by painting their backs with tar and other irritant substances. Some families of mice are more susceptible than others. By studying the disease in these small animals, valuable information has been obtained. Rats are also occasionally infected with a cancer of the stomach which was at one time attributed to a worm, a parasite of the cockroach. Chickens are also affected with tumours, and a great advance in the study of the disease followed the discovery by Dr. Peyton Rous that these tumours could be transplanted artificially from one chicken to another. Such cases are not infrequently met with in this country, especially in very highly-bred birds such as the Plymouth Rock and Leghorn. A very interesting cancer sometimes occurs in old grey horses, and is generally encountered at the base of the tail. It is heavily laden with melanin, due to the depigmentation of the skin and hair. Another cancer which appears to be of considerable interest is one which is occasionally met with in old Hereford cattle in this country, and develops in and around the eye. A similar condition has been noted in Herefords in Texas. Its incidence suggests that if cancer is due to some microbe or virus, the infecting agent must be very widely disseminated. But if so, why is the infection limited to old Herefords, and why are young Herefords and cattle of other breeds not affected? If the cause of the disease is ubiquitous, it would appear that cattle generally are resistant to it. But why, again, is it that the eye of old Hereford cattle alone is the only seat of the disease? In what respect does the eye of Hereford cattle differ from that of cattle of other breeds? The difference appears to be in the fact that there is frequently no pigment around the eyes of animals of this breed. It is widely believed that cancer is associated with constant irritation. It may be that the eyes of Herefords, being unprotected by pigment, are unduly irritated by the rays of the tropical sun. But if so, why are not the eyes of younger Hereford cattle affected? Cancer is known to be a disease of senescence. "Human and animal experience also agree in showing that cancer follows injury only after a

long latent period, during which the irritation may or may not be continued. The interval in mice is of the order of one-third of their natural span of life; a corresponding period of 15 to 20 years is suggested by the human data. If man lived, like a wild animal, only for the years of his physical perfection, and generally finished about 30 or 35, few people would have malignant tumours. They are not common until ages of 40 and upwards are reached—a prime fact in their epidemiology which is consistent with the view that irritants are the most important stimuli of cancerous growth, especially when this mode of response is given better chances to emerge by man's unnatural habit of keeping himself alive a good deal longer than was intended" ("Nature," 5.1.29, page 3). But stay! Where are we getting to? We were considering the cancer of the eyes of old Hereford cattle in Southern Rhodesia, and here we are discussing the age incidence of cancer in man. We are adopting the comparative method.

Tuberculosis also is a scourge of the young and old human subject. Strangely enough, it is met with in the lower animals. Cows, some 30 per cent. of them in Great Britain, are the victims of this disease; their disease products are transmitted to the human young. The pig, the domestic fowl, the parrot, the canary and the fish are all subject to this appalling disease. Each one of these manifests the disease in a different manner, but each one of them carries the causal organism of the infection, the tubercle bacillus, and each one can transfer the microbe from itself to another. Even the microbes vary slightly in their different hosts. How limited would the study of tuberculosis be if it were restricted to one subject—man. The only way to arrive at the fundamental facts concerning it is to study it in all its phases, in all its victims, in all its manifestations. The only way to study tuberculosis is by the comparative method.

Malaria.—Let us take another disease, malaria of man. So much, but, withal, so little is known about malaria. In 1880 Laveran discovered that malaria was due to the invasion of the red blood cells by a protozoal parasite. In 1894 Sir Patrick Manson, as the result of his experience with another disease, filariasis, which is transmitted by the bite of the culex mosquito, conceived the idea that malaria might

be conveyed in a similar manner. In 1898 Sir Ronald Ross, by studying the life cycle of the parasite of bird malaria in "grey mosquitoes," found that Manson's "brilliant induction" was correct, and that human malaria was transmitted by "dapple-winged mosquitoes." This discovery is said to have opened up a new field of research, a new chapter in the study of medicine. This is not quite correct, because in 1893 Smith and Kilborne had found that a very similar disease of cattle, Texas fever, was transmitted from an infected to a susceptible ox by means of the tick, and had worked out the miraculous manner of its transference. However, Ross's discovery solved part of the riddle of malaria, but not the whole of it. For example, since 1639 it has been known that quinine exerts a profound effect upon the course of malaria, and is almost a cure. How it acted and the best way of applying it was not known then and is not known to the therapeutists of the present day. They know what it does, but not how it does it. They do not even know how, when and why to apply it. Warrington Yorke suggests that it acts by splitting up the parasite as it passes from cell to cell and by liberating its toxins gives rise to a stimulus which results in the production of antitoxins which neutralise the toxins of the parasite when it emerges again and so disarm it. This is "on all fours" with what happens in the treatment of redwater of cattle by trypan blue, a drug which cures the animal, but does not finally destroy the parasite, which the ox continues to carry, although unharmed by it. The treated animal becomes resistant to the poisons, the redwater parasite is disarmed—its weapons are rendered innocuous. That may be the case with the malaria parasite when opposed by quinine, but the question, like official documents, is still under consideration. Nor is it known whether the malaria parasite in the "salted" subject, the "old hand," who occasionally suffers from a "touch of malaria," is lying latent until opportunity arises for it to become pathogenic. In other words, whether, as in the banana, parthenogenesis occurs. So much is known about malaria, but so much remains a mystery. Similar diseases occur in animals. Redwater in cattle, biliary fever in dogs and even gall-sickness or anaplasmosis of cattle have many similarities. The riddle of malaria and blackwater fever might be solved by a consideration of the comparable diseases in the lower animals.

Trypanosomes.—The history of the study of the trypanosomes and the diseases caused by them affords another example of the value of comparative research. As early as 1841 a trypanosome was found in the blood of a trout, and a little later similar parasites were met with in frogs. In 1878 Lewis discovered them in the blood of rats in Calcutta, and in 1880 Griffith Evans, a veterinary surgeon, demonstrated them to be the cause of a disease of horses and camels called surra. Fifteen years later Bruce found them in cases of nagana of horses and cattle in Zululand. In 1902 Dutton described a trypanosome discovered by Forde in the blood of a man in the Gambia, and the following year Castellani announced his discovery of a trypanosome in the cerebro-spinal fluid of a case of sleeping sickness in Uganda. These details, taken from Wenyon's book on protozoology, show how diseases such as these cannot be studied in any one species. In his original report, dated 1896, a copy of which is before the writer, Bruce indicates the efficacy of arsenic as a curative agent in cases of nagana. The present-day derivatives of arsenic, Bayer 205, Tryparsamide and others of the same kind, have been the means of saving many thousands of human lives. The foregoing are but a few examples of the many diseases which are common to man and the lower animals, but indicate how an exact knowledge can only be acquired by studying them in their various hosts. Human and veterinary pathology not only run in parallel lines—they actually converge.

Ophthalmia is a disease which is very prevalent throughout the length and breadth of this country, and occasions considerable losses, not so much through the death of animals, for these are rare, but by the "setback" and loss of condition it causes and by the time and labour spent in treating its victims.

All classes of cattle are susceptible, but the more highly bred exotic types appear to be more liable than the native animals of the country. Well-bred calves and yearlings, especially those kept under unhygienic conditions, are commonly affected. Half-breds appear to be less susceptible than pure-breds, and oxen than dairy or breeding stock. Outbreaks have been known which commenced with the pure-bred calves, passed from them to the older better-bred

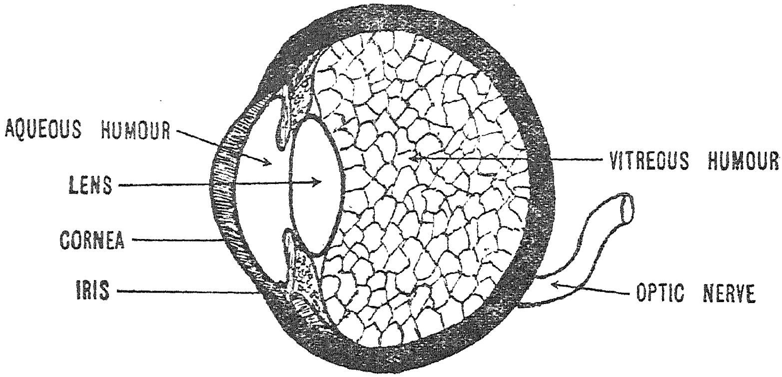
animals, and, gaining in virulence, finally attacked the working oxen and native-bred cattle.

The disease appears to be highly infectious and to gather virulence by passage—that is, by transmission from one animal to another. It appears to be most prevalent towards the end of the dry season and at the commencement of the rains, but many reports indicate that it occurs in varying degrees of severity throughout the year. There are different kinds of ophthalmia, one of which is caused by a minute worm, the larval forms of *filaria cervina*, but this is rarely encountered in this country. The majority of cases of ophthalmia met with are not due to this cause.

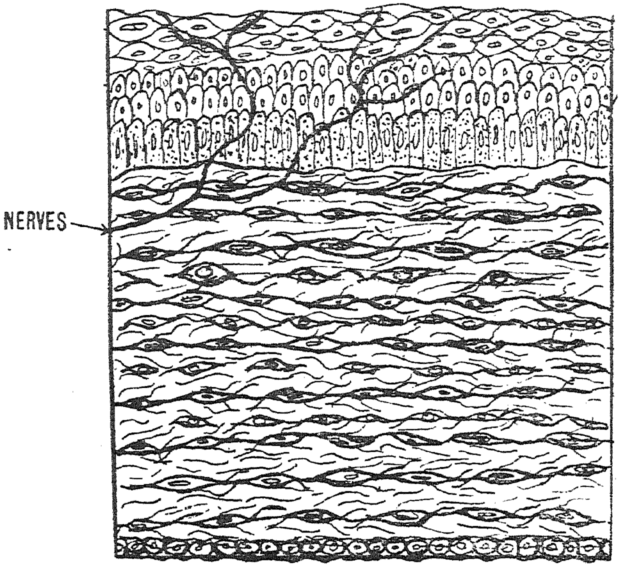
In order to obtain a more correct knowledge of the conditions known as ophthalmia, it may be well to first study the structure of the eye.

The eyes are set in cavities known as the orbits, within which they are surrounded by a quantity of fat upon which they rest and move. The eye is protected by two eyelids, and in the ox by a third rudimentary lid, known as the "haw," situated at the inner corner beneath the other lids. Along the free edges of the lids are inserted the eyelashes, which assist in protecting the eye from dust and other foreign bodies. The eyelids, which are very sensitive, are rapidly closed and opened by muscles, and are lined by a delicate membrane called the *conjunctiva*, which is reflected over the surface of the eyeball. At the upper and outer aspect of the orbit is situated the lachrymal gland, which secretes the tears. These bathe and lubricate the eye and wash it free from dust and foreign bodies. On the margin of the lids towards the inner canthus or corner of the eye is the opening of the *lachrymal duct*, through which excess of tears reaches the nasal cavity.

The eyeball, as shown in the diagram, is made up of a number of structures. Some five-sixths of its outer covering is composed of a white fibrous tissue known as the *sclerotic coat*, and in front, occupying the remaining sixth, is the transparent *cornea*, like a window, through which the rays of light pass. The anterior chamber of the eye is filled with a clear lymph-like fluid known as the *aqueous humour*. Being regulated by the *iris* or pupil, the rays then pass through the *crystalline lens*, a marvellous transparent struc-



VERTICAL SECTION OF THE EYE.



VERTICAL SECTION OF THE CORNEA
SHEWING LAYERS OF CELLS

ture made up of a series of concentric layers which can be peeled off like the coats of an onion. As the rays of light pass through the cornea and lens they are reflected or bent. Behind the lens the cavity of the ball is filled with a viscid jelly-like fluid called the *vitreous humour*, which maintains the pressure by which the eyeball retains its shape. The rays of light passing through this are focussed upon the *retina* or nervous coat, in which the nerve fibres or the optic nerve are distributed. These terminate in a wonderful arrangement of nerve cells, from which the sensations of light are conveyed to the brain, the optic nerve itself being actually an outgrowth from it. The eye may be compared to a photographic camera, but is far more delicate and complex.

It is not the object of this note to discuss how the functions of the eye are performed, but to study certain parts of it, namely, the *conjunctiva* and *cornea*, in order that a more correct knowledge may be obtained to assist us to understand the conditions loosely described as ophthalmia.

The *conjunctiva*, as it name implies, joins the eyelids to the eyeball. It is a highly vascular and sensitive mucous membrane continuous with the skin at the border of the eyes, lining the inner surface of each and reflected on to the eyeball as far as the margin of the cornea. It also covers the *membrana nictitans* or third eyelid. The contiguous surfaces of the conjunctiva are lubricated by tears from the lachrymal gland. The rapid movements of the eyelids and *membrana nictitans*, also, we are told, known as the "winking eyelid," are thus facilitated, and enable them to protect the eye from dust and other foreign bodies. The highly sensitive nature of the whole arrangement assists in this natural means of defence.

The *cornea*, as has been said before, is a transparent membrane forming the anterior portion of the eye, through which light passes as through a window. It is made up of several layers of cells, as shown in the diagram. Immediately between it is the aqueous humour, which can escape through holes caused by injuries or ulcers. It is important to remember that the cornea is not just a membrane composed of a single layer of cells, but of many layers, and one in particular is made up of many layers of branched transparent corpuscles arranged parallel to the free surface. The

popular method of treatment by "cutting away the film" is therefore more heroic than wise. The cornea has no blood vessels penetrating its structure, nor yet lymphatic vessels proper. These would interfere with sight. It is nourished by the circulation of lymph in the spaces in which the corpuscles lie. It is the coagulation of this lymph which leads to the opacity which is often spoken of as a "film over the eye" and which amateurs seek to remove so courageously and by such drastic methods. Now we can all see how foolish they are, for if they were to succeed they would cut away the front of the eye and the aqueous humour would escape.

The two conditions in which we are most interested are *Conjunctivitis*, or inflammation of the conjunctival membranes, and *Keratitis*, or inflammation or opacity of the cornea. The conjunctiva, as we know, is a very sensitive, highly vascular membrane, and the first signs of conjunctivitis are redness and swelling of the lining membrane of the eyelids and an excessive discharge of tears. They may overflow and run down the cheeks, which become scalded. In course of time, sometimes quite rapidly, the condition becomes aggravated. The eye is closed and the discharges from it become purulent and septic, attracting flies, which give rise to further irritation, and possibly transmit infection. Sometimes the condition improves, but frequently it passes on to *Keratitis*, or inflammation of the cornea. At first only a slight haze, but later a dense bluish opacity may be noticed. This may spread over the whole of the cornea, or may be more marked in one part than another. Later the opacity may become more dense and concentrated, and an ulcer may occur or an abscess form in the cornea. In some cases a projection as large as a pea may protrude from the surface; this is sometimes pinkish in colour. If the cornea ruptures, the *aqueous humour* may escape. The blood vessels around the cornea may become congested, but, as was said before, there are no blood vessels in the depth of the cornea. In some cases blood vessels run out from the margins of the cornea and run towards the centre or towards the edge of the ulcer if one is present. This gives rise to a condition known as *panus*, which takes a long time to clear up. The opacity of the cornea is caused, as we have already said, by the coagulation of lymph in the spaces of the cornea. It cannot be absorbed or removed suddenly. Any drastic treat-

ment only adds to the irritation and inflammation which caused the opacity. The opaque material has to be absorbed, and in the absence of blood vessels this is a lengthy process. Any injury to, let us say, a finger, whether a wound, bruise, ulcer or abscess, does not heal instantaneously. Heat, pain, redness and swelling occur, and the slow process of repair has to run its ordinary course. Yet we are asked to believe by the exponents of certain lightning cures that the opacity of the cornea can be removed as if by magic and a healthy eye be reproduced in a few hours.

There are no doubt many causes of conjunctivitis and keratitis. There may be one or more which are specific, but these, as far as we know, have not been identified. A certain moth has been accused of transmitting the disease, and in the "old days" transport riders would avoid certain outspans where the so-called "eye-moth" was known to occur. This small straw-coloured moth was known to hover around the eyes of cattle at night. The idea was that it punctured or irritated the eye in order to produce a flow of tears, which it imbibed like nectar. Whether there is any truth in this idea it is impossible to say. These moths have been collected and placed in a stable with cattle, but they have never been caught at their nefarious practices. Also, of course, ophthalmia occurs in the absence of these moths, and indeed has been known to occur apparently spontaneously in animals which for months have never been out of a stable and had certainly not been infected by a moth.

The eye is naturally protected from injury by the eyelashes, the rapidity of the movement of the eyelids, including the third lid, which moves across the eye, sweeping off any invading bodies, and the flow of tears, which are themselves antiseptic. But in spite of these defences, foreign bodies and blows may injure the eye. A few minutes' observation at a dipping tank when cattle are being dipped will reveal many common sources of injury. Natives driving the herds are apt to hit the animals about the face with sticks and whips; crowded animals flick their tails into each other's eyes; heads are violently banged against the walls of collecting pens and crush; and although the eye is generally closed so quickly that dip rarely enters it, if cattle are watched in the draining pen it appears that it occasionally does so. At

any time particles of dust and dirt, grass seeds, pollen, and no doubt smaller objects, such as bacteria and fungi, may enter the eye. Indeed, as has been stated before, there appears to be reason to believe that there is an infectious form of the disease, possibly due to a micro-organism, and that this is readily transmitted from sick to healthy. It is possible that in some cases a primary injury is inflicted and that the injured surface is invaded by secondary organisms which give rise to ulceration and sepsis. This hypothesis may or may not be correct. It is being investigated, and a method of treatment based upon it is even now being tested out.

We now come to the question of treatment. The remedies which are recommended are innumerable; and there are enthusiasts to vouch for the efficacy of each and every one of them. Many of them are actually harmful, aggravating the inflammation which it is sought to remove. Others are extremely painful and cruel. A good test of any remedy would be for the exponent of it to first apply it to his own eye, which is probably no more sensitive than that of his victim. The list would probably become considerably reduced. Most of these remedies are intended to "cut the film," which, as we know, is wrong in principle. These include crushed glass and the powdered shell of the millipede. Other treatments are antiseptic, although the users of them are not necessarily aware of the fact. Such are beneficial, in that they may destroy any infective organism which may be the cause of the disease, but they may also be harmful, in that they may be irritant and corrosive and so may aggravate the inflammatory condition which already exists. Among these are corrosive sublimate, blue stone, silver nitrate and zinc sulphate, which, as often as not, are used in too strong solution. Other agents are insoluble and act as foreign bodies. The inconvenience and pain caused by a small fly or a speck of dust in the eye is known to most of us, and should excite more sympathy for our dumb patients, which have to submit to the forcible introduction of irritating and pain-producing ingredients into their eyes. Calomel, red lead, yellow oxide of mercury are widely advocated. Whether they are particularly irritant or not the writer has not had the courage to determine by the test suggested. Some ointments are also recommended, and these are pro-

bably less harmful than over-strong solutions or insoluble irritants. One good feature of a greasy compound is that it is only inserted into the eye with some difficulty and is easily ejected, unless, of course, it is freely mixed with dirt and sand, which is often the case. Perhaps its greatest merit is that if spread round and beneath the eye it may assist the escape of tears which would otherwise scald the cheeks and attract flies.

The best remedies are those which do no harm even if they do no particular good. In order to wash out foreign bodies and exert some slight antiseptic action a 2 per cent. solution of boracic acid, a ½ per cent. solution of zinc sulphate, a 5 per cent. solution of hyposulphite of soda, may be syringed carefully into the eye, the lids of which may then be anointed with boric acid ointment or yellow mercuric ointment.

Cure is delayed if the irritation and possibly infection is constantly renewed by improper remedies and flies. Some fly-repellent ointment containing, say, oil of tar, oil of citronella, or one of the many proprietary preparations should be smeared around and beneath the eye. Treatment to be successful should be applied early in order to arrest the disease before damage, which may take months to repair, has been effected, and should be carefully—not brutally—applied, because the eye is a particularly delicate and sensitive organ. There is some evidence which suggests that there is in certain animals a susceptibility to, and in others a resistance to, infection. This is a feature of the disease which is receiving consideration at the Laboratory, and any information or observation having a bearing upon it will be welcomed. Prevention is always better than cure, and if animals could be protected against ophthalmia in some such manner as they are against quarter evil and other diseases, they would be spared great pain and their owners considerable loss and inconvenience.

Dosing of Sheep.—The treatment of sheep with the so-called "Union Wireworm Remedy" has proved extremely successful and beneficial and has considerably reduced the risks of sheep breeding in this country. But in the past there have been certain drawbacks in connection with it which have made it rather unpopular, especially to the

farmer whose sheep were merely a side-line in the general farm routine. The chief objection to the treatment was that it occupied a period of two days, during which the sheep had to be housed or kraaled and kept from food and water. In the December issue of "Farming in South Africa," a paper which every farmer in Southern Rhodesia should obtain, Dr. H. O. Monnig, of Onderstepoort, contributes an article in which he points out that the preliminary starvation of sheep before treatment is not only unnecessary but actually disadvantageous. He writes: "Experience gained during a number of years after the introduction of the Government Wireworm Remedy has shown clearly that the regular use of this remedy is of the greatest importance, not only in reducing wireworm infection to a negligible minimum and maintaining this situation, but also in preventing infection with other worms against which no effective remedies are available. Regular dosing rather than occasional treatment is, therefore, strongly advocated, and is being adhered to by all farmers who have once experienced the benefits of this measure. This, however, entails the dosing of large flocks under a great variety of conditions, which are not always ideal and cannot be selected, and the preliminary starvation in many cases undoubtedly adds to the difficulties. After the investigation of a number of cases in which difficulties had been encountered, and due consideration of the accumulated facts and experiences, it was concluded that preliminary starvation was disadvantageous for the following reasons:—

"1. When the grazing and the condition of the sheep are poor, starvation is undesirable as such and also because it may cause susceptibility to poisoning by the remedy, which is otherwise safe in good-conditioned sheep.

"2. After starvation and treatment, the sheep may be so hungry that they will eat indiscriminately, and may eat poisonous plants, or they may over-eat themselves and indigestion could be the result, manifesting itself by bloating or partial paralysis of the fore-stomachs.

"3. When the sheep are let out in the early afternoon during summer, hunger may drive them to eat wilted young grass, and hydrocyanic acid poisoning (geilsiekte) would be

the result. For this reason, the most convenient time for treatment with starvation is unsuitable, since it may lead to poisoning—without starvation, a safer time for treatment could be found. After the above conclusions had been drawn, it became necessary to investigate the necessity of starvation of sheep before administration of the remedy. The tests had to show whether the desired objects of starvation could be attained in sheep, and if not, whether treatment without starvation would be safe and effective. The following were the results of these tests:—

"(1) Reduction of contents of stomach and intestines. No new tests were made, since already-observed cases showed sufficiently that even 20 hours' starvation was not effective in removing more than a small part of the contents of the fore-stomachs. In some cases the quantities contained were normal or even maximum after 20 hours' starvation.

"(2) Reduction of movements of alimentary canal. As had previously been observed, it was found that the process of rumination (chewing the cud) usually slowed down as starvation proceeded, and in some cases stopped completely after 18 hours. Of much greater importance, however, are the normal stomach movements, which can be determined by careful observation. For this purpose the normal movements of twenty sheep were determined and then ten of them were starved, the movements in both starved and unstarved groups being determined at fixed intervals thereafter. It was found that up to 24 hours' starvation did not reduce the movements to any appreciable extent, probably because the quantity of the contents was not much reduced. It was then concluded that the usual objects of starvation could not be attained in sheep.

"(3) The safety and efficacy of the remedy without preliminary starvation. It has been sufficiently shown that the drinking of water a short while before or after dosing with the remedy is dangerous, and hence the necessary restriction in this respect must always be observed. In order to fix a convenient time for dosing that would satisfy a number of necessary and desirable requirements, the following scheme was devised:—The sheep are watered in the morning, as early as possible, and graze until shortly before the dosing, which is carried out as late as possible in the afternoon. About

an hour before dosing is to commence the sheep are kraaled and allowed to rest. After dosing, the sheep remain in the kraal overnight and are released the following morning to graze and drink.

"A number of carefully controlled treatments under this scheme proved the efficacy of the remedy to be the same as in cases with preliminary starvation.

"A large number of cases treated during two years have shown that this method is as safe as dosing with preliminary starvation."

It is to be regretted that this was not discovered before. Much time and trouble would have been spared the conscientious farmer who strictly observed a line of treatment which we now find was not only unnecessary, but actually disadvantageous. The new and less irksome method will appeal to the Rhodesian sheep farmer.

Humane Slaughter.—Elsewhere in this issue is an article by Lieut.-Col. E. Hope Carson, D.S.O., on the subject of the humane killing of domestic stock. On this subject the Colonel is an enthusiast. From the information that he has collected it would appear that much needless cruelty takes place in the manner of killing animals on the farm—work which is often entrusted to natives. It is unlikely that any Rhodesian farmer would be guilty of deliberate cruelty to his animals or would tolerate it if he were aware of it. A good man is merciful to his beasts, and as a rule does not torture even those which he is about to eat. It appears to be a matter for the S.P.C.A. or Police rather than a subject for these notes. The article is accompanied by diagrams indicating the position of the brain in the lower animals.

Wheat-Growing in S. Rhodesia.

SOME RECENT EXPERIENCES AND RESULTS.

By the DIVISION OF THE CHIEF AGRICULTURIST.

The following brief notes on the methods employed and the results obtained by certain farmers growing wheat in this country are published, since it is thought that they will be of general interest to other wheat producers.

At the same time we may remind farmers that the amount of wheat grown in Southern Rhodesia is at present only 12 per cent. of the amount consumed,* and there is no doubt that a great deal more could be profitably grown while wheat remains at the prices quoted on local markets in recent years.

Mr. W. G. Hamman, of Mooifontein, Umvuma, has kindly supplied the information comprised in the following short account of the results obtained by him under irrigation during the last season. The soil on which his crop was grown is a very light, sandy loam, typical of the district, and of a light yellowish-brown colour.

For facility of reference the wheat lands are divided into three fields, A, B and C.

Field A.—The previous cropping and treatment of this field were as follows:—

June, 1927: First broken up.

November, 1927: Tobacco planted with 100 lbs. of tobacco fertiliser per acre.

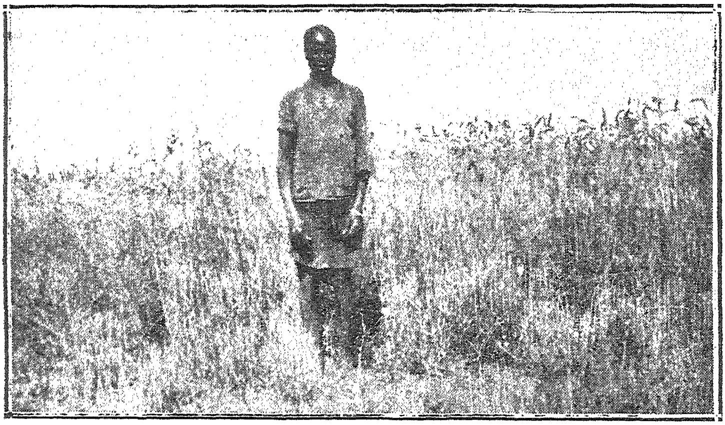
May, 1928: Wheat sown; 4½ tons of farm manure per acre applied. Yield of wheat, 5 bags of 25 lbs. per acre.

Summer, 1928: Kaffir beans sown; crop ploughed under in March, 1929.

* Report on Winter Crop Returns for 1927-28 by the Government Statistician.

In the last week of May, 1929, wheat was again sown broadcast on this field at the rate of 60 lbs. per acre; 200 lbs. per acre of No. 1 high grade superphosphate were also applied to the land before sowing.

The average yield of wheat over the whole field was 7 bags per acre. One acre cut from the best portion of the field yielded 10¼ bags, but the average of the whole field was reduced by the poor yield obtained on four acres, which were much too wet at the time of planting and gave a poor yield in consequence.



Mr. Hamman's wheat crop, yielding 10¼ bags from one acre.

The practice of green manuring irrigated wheat lands during the summer season is to be strongly recommended, and in this case, combined with the application of a moderate dressing of superphosphate, it has resulted in Mr. Hamman obtaining an increased yield of wheat over the whole field of about 40 per cent.

Kaffir beans and cowpeas are particularly suitable for green manuring light, sandy soils, but suffer from the disadvantages that they do not compete well with weeds and are somewhat difficult to plough under. Sunn hemp does not present these disadvantages. It is an admirable weed-smotherer, grows more quickly, is easily ploughed under and should certainly be tried against kaffir beans as a green manure for wheat lands.

Where financial considerations allow, it is highly probable that still better results would be obtained from the above

methods if the phosphatic fertiliser was applied to the green manure crop instead of direct to the wheat. In this way the green manure crop will obtain the benefit from the fertiliser, and so will give a heavier yield of green growth to plough under; it should also fix more nitrogen from the air, and the fertiliser will be available once again for the use of the following wheat crop, and in a more readily available form when the green crop has decomposed in the soil.

Field B.—Previous cropping and treatment:—

Summer, 1926-27: Maize without fertiliser or manure; yield per acre, approximately 3 bags.

Summer, 1927-28: Mixed crop of kaffir beans and sunflowers grown and ploughed under in March, 1928.

April, 1928: Wheat sown; farm manure applied at the rate of 6 tons per acre; yield of wheat, 4½ bags per acre.

Summer, 1928-29: Kaffir beans sown and ploughed under in March, 1929.

May, 1929: Wheat sown at the rate of 55 lbs. per acre with 100 lbs. per acre of No. 1 superphosphate. Yield of wheat, 5¾ bags per acre.

Here again Mr. Hamman has obtained a considerable increase in his yield of wheat (over 27 per cent.) over the previous year's results, after ploughing under a crop of kaffir beans and with a light application of superphosphate. Twice this amount could be used with advantage.

Field C.—Previous treatment and cropping:—

Summer, 1927: Not cropped.

Summer, 1928-29: Maize planted and ploughed under in March, 1929.

Winter, 1929: Wheat sown at the rate of 45 lbs. per acre. Yield per acre, 1 bag 175 lbs.

Though it cannot be stated with any degree of certainty of course, it is probable that the poor yield of wheat obtained on this field after ploughing under a crop of maize is due to the following reasons: (1) The maize crop had in all probability not properly decomposed in the soil, a crop of the grass family taking longer to decay than a legume; (2) maize not being a legume, the nitrogen supply in the soil had not been increased; (3) no phosphatic fertiliser was

applied, and light, sandy soil of this kind is usually very lacking in phosphates.

Mr. Hamman's methods, as demonstrated in the treatment accorded to Field A, are strongly to be recommended. In addition, for those who are growing wheat under similar conditions the following simple experiment in part or whole is suggested:—

The wheat lands should be sown in the summer to kaffir beans or Sunn hemp, preferably the latter. Previous to sowing the green manure crop, different plots, which should be duplicated if possible, should be given the following dressings of fertiliser: (1) 200 lbs. of superphosphate per acre; (2) 200 lbs. of rock phosphate per acre; (3) 200 lbs. of superphosphate plus 50 lbs. of muriate of potash per acre; (4) 200 lbs. of rock phosphate plus 50 lbs. of muriate of potash per acre. Other plots should receive no fertiliser on the green crop to act as controls, while other plots should be similarly green manured, but receive the dressing of fertiliser just before the wheat crop is sown.

If carefully carried out, the above experiment will provide the farmer with very valuable information as to how best to fertilise his wheat lands.

Most of the light, sandy soils utilised for wheat growing in this country are deficient in potash, and it is well worth while to test the effect on the wheat of a light dressing of muriate of potash in conjunction with phosphatic manures. Rock phosphate is the cheapest form of phosphate available to the farmer to-day, and the slowness of its availability is of less importance where it is applied to the green manure crop, for the length of time it is in the ground before planting the main crop (wheat in this case) and the large bacterial activity during decomposition of the green manure tend to make it more rapidly available to the following crop.

Mr. G. R. Syfret, on his farm The Springs, in the Arcturus district, on a small portion of his wheat lands, obtained this season what is probably a record yield of wheat for this country, namely something over 14 bags per acre. The soil on which this crop was grown is the typical bright red medium loam of the district. The land was virgin and first sown to a crop of Sunn hemp in the summer of 1928-29. The Sunn hemp crop received a dressing of about 600 lbs. per acre of rock phosphate, and was ploughed under in the

autumn, and in the winter of 1929 wheat was sown without further treatment. The crop was reaped in October last and gave the yield of grain stated above. The seed was sown with a wheat drill.

No comment is necessary, as the results speak very loudly for themselves. The type of wheat sown was a variety selected from a strain originally obtained by Mr. Syfret from Karachi, India. It is a type very closely akin to that known in this country as Klein Koren.

Mr. A. R. Morkel, of Ceres Farm, Shamva, who is the largest grower of irrigated wheat in this country, this last winter obtained a yield of just over 10 bags per acre of wheat from a small portion of his land. The type grown by Mr. Morkel is a mixture of red and white Klein Koren, a bearded, free-tillering variety which has out-yielded a number of other well known strains of wheat in a variety test carefully carried out by him on his farm this season. Mr. Morkel has kindly consented to the results of this variety test being published:

	Number of plots.	Average yield per acre in lbs.
Klein Koren	7	759
Droop No. 3	2	398
Kenya Governor	1	271
Quality	3	232
A.E.S. No. 4	2	125

The size of all the plots was originally one acre each, but the area of a few was slightly reduced owing to factors outside the experiment, and this does not affect the results.

It will be seen that Mr. Morkel's own Klein Koren wheat out-yielded its nearest competitor by nearly 100 per cent.

In justice to the other varieties grown, however, which are giving excellent results in other parts of the country, it must be mentioned that whereas the rate of seeding (40 lbs. per acre) appeared to be almost sufficiently high for Klein Koren, a free-tillering variety, in the case of the other kinds it was little more than half the recommended rate of seeding.

For Droop No. 3, Quality and Kenya Governor a seeding rate of about 60 to 70 lbs. per acre is usually advisable. Another point militating against the performance of these three varieties was the fact that they were not acclimatised to the local conditions, as was the Klein Koren.

Bulawayo Municipal Demonstration Station.

REPORT FOR THE SEASONS 1927-28 AND 1928-29.

By D. E. McLoughlin, Assistant Agriculturist.

This station has now completed the eighth year of its existence. The actual work has been carried out by the employees of the Bulawayo Municipal Council, under the direction of the Town Ranger, the planning and supervision of the experiments being undertaken by the Division of the Chief Agriculturist.

Since its commencement and until 1928 the work at the station was very thoroughly carried on by Mr. L. Babb, the late Commonage Ranger, who retired on pension that year. A further severe loss to the station in the same year was the death of the late Town Clerk, Mr. Fitch. Both these gentlemen, from its inception, took a very keen and personal interest in the success of the station, and the Department of Agriculture is greatly indebted to them for their untiring assistance and encouragement.

Mr. J. Dunn, the newly appointed Commonage Ranger, succeeds Mr. Babb in charge of the work.

While it has not been possible at this centre to carry out such detailed field research as at the Salisbury Experiment Station, yet the results obtained have very usefully served the intervening period from 1921 up to the time of the establishment of a school of agriculture at Matopos, at which institution this work can now be further developed.

The experiments have been planned with a view to demonstrating to what extent the more important lessons learnt from investigations carried on at the Salisbury Experiment

Station were applicable to the drier conditions of Matabeleland, and since the general principles of good field husbandry usually apply the world over, the results, as was expected, are very much in accord with those obtained on the other experiment stations of the Colony.

The average annual rainfall for the eight years' period was 23.61 inches, the lowest fall in any one season being 13.09 inches in 1926-27 and the highest 45.07 inches in 1924-25. During the eight years only one season has verged on a normal rainfall, while in four seasons the precipitation was distinctly below normal.

The 1927-28 season proved the most disappointing of all, since the precipitation during its opening period, December to January, totalled nearly ten inches, and led all to believe that Matabeleland was to reap a record harvest. These high hopes were speedily dispelled, when in February the rains literally ceased. Owing to the complete drought which followed it was considered more remunerative to the Town Council to ensile or convert into dry fodder nearly all the crops, and this procedure was accordingly followed.

In spite of this the results from a demonstration point of view again confirmed the lessons of previous dry years, namely, that even under such conditions a wide range of fodder crops can be grown in Matabeleland.

The season 1928-29 was a favourable one generally, though the rains from the last week in January to the second week in February were excessive, and during the same period a cold spell retarded growth. As usual the land had been ploughed during the preceding winter and was in a good state to absorb and retain much of the rain which fell during November and early December. This factor was responsible for a good seed bed and an excellent germination.

The highest yield of maize, namely, 19.33 bags per acre, was obtained in the rotation series "Maize after legumes reaped," with an application of 200 lbs. superphosphates per acre, the lowest yield in that same series being 16.62 bags per acre.

All the maize for grain experiments here reported on are carried out on plots not smaller than a quarter of an acre in

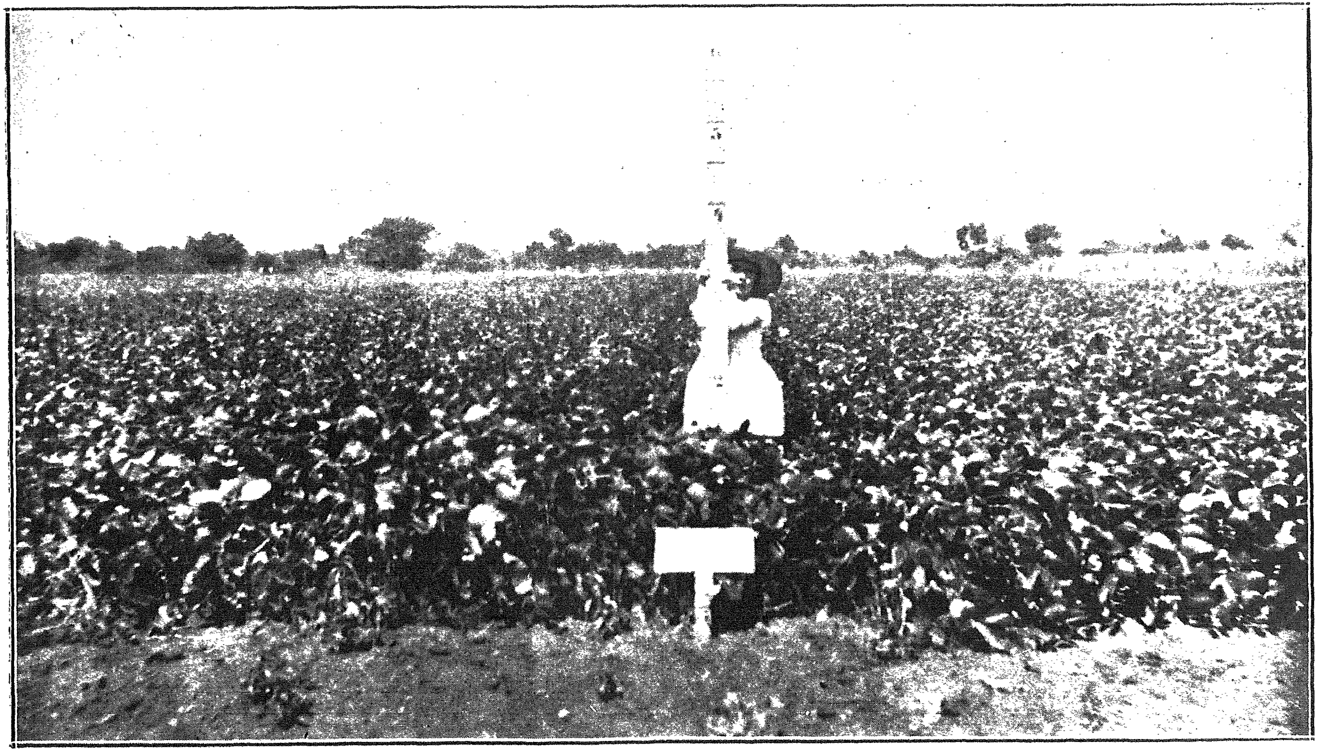
area, the number consisting of sixteen plots of half an acre, and twenty-one plots of a quarter of an acre each.

A comparison of the average yields obtained to date from the different systems of cropping provides a useful example of what may be accomplished under local conditions in Matabeleland if the more successful methods which have been demonstrated are followed.

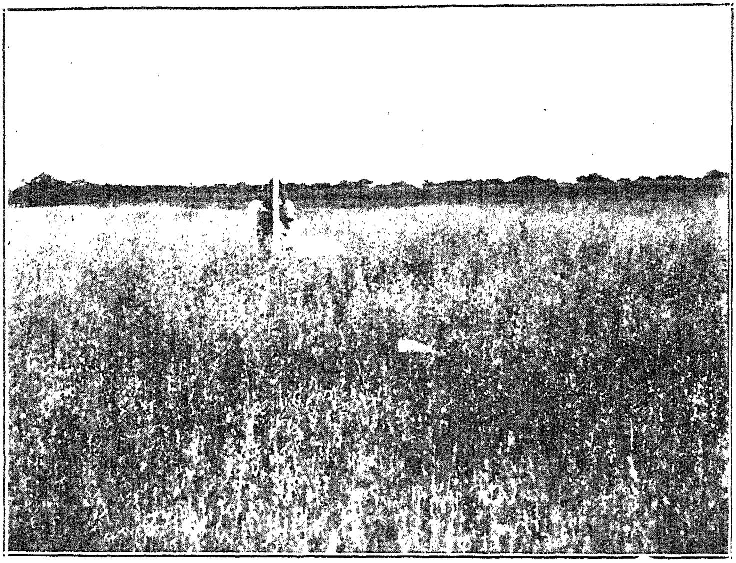
ANALYSIS OF RAINFALL, SEASON 1928-29.

The distribution of the rains for 1928-29 and for the previous seven years was as follows:—

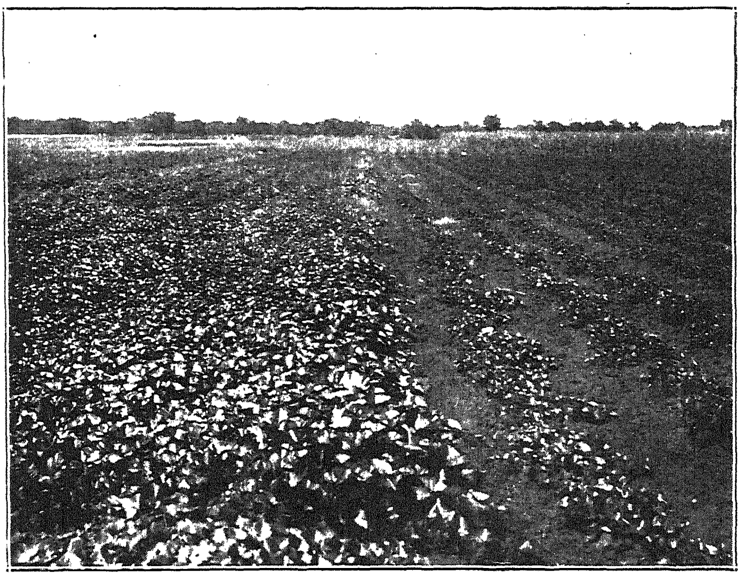
Month.	No. of days on which rain fell.	Total for month, in inches.	No. of rains exceeding ¼ inch.	Total to end of month, in inches.
September ...	1	0.89	1	0.89
October ...	0	nil	0	0.89
November ...	5	3.09	5	3.98
December ...	9	6.74	7	10.72
January ...	11	8.81	9	19.53
February ...	7	6.47	5	26.00
March ...	8	7.46	5	33.46
April ...	1	0.02	0	33.48
May ...	1	0.18	0	33.66
Totals ...	43	33.66	32	33.66



Velvet beans grown on a rainfall of 13.09 inches. Bulawayo Municipal Experiment Station.



Kherson oats, without fertiliser or manure.
Bulawayo Municipal Experiment Station.



Sweet potatoes (calabash) on left from tubers left in ground over the dry season. On right, planted from cuttings.

AVERAGES FOR LAST EIGHT YEARS, SEASONS 1921-29. (In inches.)

Year.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March	April.	May.	Total.
1921-22	nil	0.68	4.87	5.03	0.88	0.69	0.33	nil	nil	12 48*
1922-23	,,	1.65	1.97	3.75	6.69	8.76	10.40	,,	,,	33.22
1923-24	,,	nil	3.00	1.20	4.17	4.18	2.70	,,	,,	15.25
1924-25	,,	0.79	5.15	10.11	5.09	6.95	9.91	3.66	3.41	45.07
1925-26	,,	nil	0.53	0.97	3.78	5.49	10.77	nil	nil	21.54
1926-27	,,	,,	1.27	4.33	2.61	4.44	0.44	,,	,,	13.09
1927-28	,,	1.84	1.50	4.22	5.58	0.77	0.64	0.07	,,	14.62
1928-29	0.89	nil	3.09	6.74	8.81	6.47	7.46	0.02	0.18	33.66
Average	0.11	0.62	2.67	4.54	4.70	4.72	5.33	0.47	0.45	23.61

ROTATION EXPERIMENTS.

The two four-course rotations—series A and B—demonstrate the effect of two alternative systems of cropping on the permanent fertility of the soil. They are designed to meet the requirements of the farmer who follows a mixed farming system, combining live stock with the production of cash crops. In one of these two systems the humus supply is maintained by the application of farm manure, and in the other by a legume, which is ploughed under as a green manure. Both rotational systems are well balanced, and the farmer who has an insufficient supply of farm manure to dress the whole of his acreage with sufficient frequency may with safety adopt the alternative system of green manuring.

The land in each case during the four years grows two crops of maize and one of velvet beans, and one of Sudan grass (series A) and oats (series B).

In series A seven tons of farm manure are applied every fourth year to the one maize crop, while the velvet beans are reaped for green fodder or hay and the stubble ploughed in. Commencing in the season 1926-27, the maize following

* Recorded at Bulawayo Park, about one mile distant from the Experiment Station.

velvet beans reaped received 200 lbs. of superphosphate (19 per cent.) per acre.

In series B no animal manure is used, but the velvet bean crop is ploughed under as a green manure, and the following maize crop receives a dressing of artificial fertiliser consisting of superphosphate at the rate of 200 lbs. per acre. Here, too, from the season 1926-27 the maize following after oats has received fertiliser. Thus in the one rotation (A) the land receives 7 tons farm manure and 200 lbs. superphosphates per acre during every four-year period; while in rotation B, during a similar period, it receives one green manuring with velvet beans and 400 lbs. of superphosphates per acre.

The maize continuous experiment—series E and F—provides a check on the above rotations. In the one case (series E) the maize has been grown year after year on the same land without any application of manure or fertiliser. In the other, series F, three applications of 160 lbs. per acre of bone and superphosphate have been applied during the last five years, but no organic matter has been given to the land either by means of green manuring or farm manure.

Rotation (Series A).

Date of planting: Maize, 12th December, 1928; velvet beans, 24th November, 1928; Sudan grass, 6th December, 1928.

Yield in bags per acre.

Crop.	Yield per acre, 1928-29.	Average yield per acre to date.
Maize, plus 7 tons farm manure, per acre	14.0	12.3 (6 years)
Velvet beans	9,517 lbs. green fodder (6,882 lbs., 1927-28)	11,018 lbs. (6 years)
Maize, plus 200 lbs. superphosphate per acre, after velvet beans reaped	12.10	10.7 (6 years)
Sudan grass—		
1st cutting	10,848 lbs. green fodder (15,136 lbs. 1927-28)	8,980 lbs. green fodder (6 years)
2nd cutting (not always obtained)	...	2,758 lbs. green fodder (3 years) 1,050 lbs. hay (1 year)

In 1924-25 velvet beans in series A were reaped for seed and yielded 7.2 bags per acre. In 1925-26, 1927-28 and

1928-29 Sudan grass did not give a second cutting and was grazed off.

Rotation (Series B).

Date of planting: Maize, 4th and 5th December, 1928; velvet beans, 23rd November, 1928; oats, 21st January, 1929.

Yield in bags per acre.

Crop.	Yield per acre, 1928-29.	Average yield per acre to date.
Maize, plus 200 lbs. superphosphates per acre, after velvet beans ploughed under	16.40	13.10 (6 years)
Velvet beans ploughed under ...	p.u.	p.u.
* Maize, plus 200 lbs. superphosphates per acre, after oats	14.30	10.55 (6 years)
Oats	502 lbs. grain	788 lbs. grain (6 years)

Maize Continuous (Series E and F).

Planted 5th December, 1928.

Crop.	Yield per acre, 1928-29.	Average yield per acre to date.
E. Maize continuous, without treatment	5.76	5.45 (6 years)
F. Maize continuous, but with 160 lbs. per acre bone and superphosphates every alternate year. Fertiliser applied 1924-25, 1925-26 (by error) and 1927-28	11.40	8.79 (6 years)

Maize and Legumes (Series C).

Date of planting: Maize, 12th January, 1929; velvet beans, 24th November, 1928; cowpeas, 1st January, 1929.

This is a four-course rotation commenced in 1922-23, consisting of cowpeas, maize, velvet beans, maize. The legumes are reaped for seed or fodder and the crop residue only is ploughed under. Whenever it may seem advisable, either of the leguminous crops could be turned under as a green manure. Commencing in the season 1924-25, the maize received fertiliser—160 lbs. bone and superphosphates per acre—in that year. In 1925-26 the application was increased to

* Commencing in 1926-27, this plot received 100 lbs. of superphosphates per acre, but in 1928-29 the application was increased to 200 lbs. per acre. Oats have failed three seasons out of seven on account of short rainfall. From 1925-26 Kinvarra oats, being quicker to mature, were substituted for the Kherson variety.

200 lbs. bone and superphosphates per acre. In 1926-27 the fertiliser was by mistake applied to the legumes instead of to the maize, and in 1927-28 the maize again received the fertiliser. Commencing 1928-29, the fertiliser was applied to the legumes in this series while continuing to be applied to the maize and not to the legumes in series D.

Crop.	1928-29.	1927-28.	Average yield to date.
* Cowpeas—			
Grain	...	268 lbs.	375 lbs. (5 years)
Green fodder	9,326 lbs.	4,584 lbs.	7,093 ,, ,,
Maize, after cowpeas reaped ...	9.18 bags	Reaped for silage	8.16 bags (6 years)
* Velvet beans—			
Grain	...	...	515 lbs. (4 years)
Green fodder	33,240 lbs.	7,688 lbs.	12,907 lbs. (5 years)
Maize, after velvet beans reaped	10.40 bags.	Reaped for silage	8.71 bags (6 years)

Maize and Legumes (Series D).

Date of planting: Maize, 12th December, 1928; velvet beans, 26th November, 1928; cowpeas, 2nd January, 1929.

In this rotation the cropping is a duplication of that in series C, but no fertiliser was applied either to the maize or to the legumes during the first cycle of four years. In 1926-27 and again in 1927-28 all four plots received farm manure at the rate of 4 tons per acre. In 1928-29 the maize received fertiliser at the rate of 200 lbs. of superphosphates per acre.

The soil on these plots is more fertile than that of series C, where it is very gravelly and shallow.

Crop.	1928-29.	1927-28.	Average yield to date.
Cowpeas—			
Grain	...	...	320 lbs. (4 years)
Green fodder	8,804 lbs.	7,872 lbs.	7,427 lbs. (5 years)
Maize, plus 200 lbs. superphosphate per acre, after cowpeas reaped	11.32 bags	Reaped for silage	8.98 bags (6 years)
Velvet beans—			
Grain	...	...	578 lbs. (4 years)
Green fodder	38,040 lbs.	8,308 lbs.	13,566 lbs. (5 years)
Maize, plus 200 lbs. superphosphate per acre, after velvet beans reaped	14.20 bags	Reaped for silage	9 bags (6 years)

* The legumes, not the maize, received the fertiliser in 1928-29.

The relative merits of the different systems may be gauged by the tabulation given on the following page. It will be seen that the fertility of the land in each of the rotation systems of cropping for the six years has been maintained at a good level. The difference in yield for the six-year period compared with the first cycle of four years is roughly only about one bag of maize per acre, and in the case of systems A, B and C the difference is due mainly to the very dry season experienced in 1926-27, whereas during the first four-year cycle, commencing in 1922-23, all the seasons were fairly favourable for high yields. The increase in system D over the total six-year period is accounted for by the additional treatment of farm manure given it in 1926-27 and 1927-28, and the normal application of fertiliser which it received in 1928-29. This series has not therefore had time to benefit by the supply of this organic matter to the same extent as have systems A and B.

Results from the different methods of cropping indicate that in each of the two series A and B, where organic matter is supplied by means of farm manure or green manuring, the yields of maize are considerably greater than in systems C and F, which have as yet received no organic matter in either form. Compared with system E, namely, "Maize continuous without any treatment," the yields are twice as high. The advantages of maintaining a good supply of organic matter in the soil is particularly well reflected by the higher yields obtained in these series, as compared with the others, in the very dry season of 1926-27.

The experiments afford proof that green manuring with a legume, aided by a light dressing of phosphate fertiliser, is fully as efficacious as an application of farm manure at the rate of 7 tons per acre. This knowledge is of the utmost importance to us in Rhodesia, when we consider how seldom it is that supplies of farm manure are anything like sufficient for the needs of the average farm.

SUMMARY OF CROP ROTATION EXPERIMENTS: SIX SERIES.

Average Yield for Six Years.

Maize yields in bags per acre.

System of cropping.	1928-29 rainfall, 33.66 in.	1926-27 rainfall, 13.09 in.	1925-26 rainfall, 21.54 in.	1924-25 rainfall, 45.07 in.	1923-24 rainfall, 15.25 in.	1922-23 rainfall, 33.22 in.	Average yields, 6 years.
A. Four-course rotation— 1. Maize + farm manure Velvet beans reaped 2. Maize, Sudan grass	14.0 and 12.0	4.07 and 6.03 Average	15.62 and 9.57 yield for 1st	20.9 and 18.1 cycle, two	10.0 and 12.25 plots—12.83	10.0 and 6.25 bags.	11.5
B. Four-course rotation— 1. Maize + fertiliser Velvet beans ploughed under 2. Maize, oats	16.40 and 14.30	7.02 and 6.45 Average	11.5 and 10.89 yield for 1st	22.0 and 16.5 cycle, two	13.5 and 8.15 plots—12.53	10.75 and 7.0 bags.	12.04
C. Four-course rotation— 1. Maize, cowpeas 2. Maize, velvet beans	9.18 10.40	2.84 2.12 Average	12.0 10.78 yield for 1st	13.2 14.5 cycle, two	6.0* 8.75* plots—9.58	5.75* 5.70* bags.	8.43
D. Four-course rotation— 1. Maize, cowpeas 2. Maize, velvet beans	11.32 14.20	3.40 9.44 Average	6.22 5.88 yield for 1st	13.9 10.4 cycle, two	6.0* 8.75* plots—7.82	5.75* 5.70* bags.	8.41
E. Maize continuous, without treatment	5.76	1.5	3.82 Average	9.8 yield for 1st	6.0* cycle—6.34	5.75* bags.	5.44
F. Maize continuous, but with fertiliser every alternate year	11.40	2.61	11.4 Average	15.6 yield for 1st	6.0* cycle—9.69	5.75* bags.	8.79

*Average yield of the two plots which received the same treatment.

MAIZE VARIETY TRIALS.

The object of this experiment has been to determine which varieties are most suitable to local conditions of soil and climate. No definite rotation was followed, but in each season the varieties were planted on the same day, received the same manurial treatment and were planted the same distances apart, on red clay-loam soil of uniform fertility. As far as possible seed of locally grown strains was used. Seed of the four standard Rhodesian varieties was supplied by recognised growers from Mashonaland. The experiments extended over a period of seven years. Four seasons out of seven recorded a rainfall below normal. In accordance with the general practice, maize was planted in moist ground and at a date when the rainy season appeared to have well set in. In all, 18 varieties have been tested, including importations from the Union of South Africa and the United States of America, but on account of their low yield or susceptibility to maize blight, many of these have been eliminated from further trials. The tests were finally reduced to the four standard white dent varieties of Rhodesia and the most promising local, acclimatised strains of yellow and white flints.

Despite the fact that seed of the former varieties had each year been grown in an environment (Mashonaland) totally different to that of Matabeleland, the standard white dent varieties out-yielded the local early maturing varieties by 2¼ bags per acre, and this in spite of the early frosts and unusually light rainfall of several of the seasons.

In only one season out of the seven, namely, in 1927-28, when the rains ceased by the middle of February, did the early flint varieties show any marked superiority over the white dents. In no other season, even with a rainfall well below normal, but recording rain throughout February, was there any difference in favour of the early flint varieties.

If reference is made to the rainfall analysis for the seven year period, it will be observed that the precipitation for the month of February is usually fairly good and seldom falls much below the average.

It may be assumed that the period of flowering occurs, roughly speaking, about half way between the first appear-

ance of the plant above ground and the date of reaching maturity. The standard dent varieties, planted reasonably early in December, should reach this critical stage at a period of the season most favourable for the fertilisation of the female flowers and the development of grain, in order to enable the seed to ripen and be safe from frost; provided always sufficient moisture remains in the soil.

The results of these experiments indicate that there is no advantage in planting early flint varieties in preference to white dents before the first week in January, since even in years of light rainfall, provided proper attention has been given to the preparatory tillage of the land, better average returns may yet be expected from the longer season white dent varieties. In this preparatory tillage, autumn and early winter, ploughing is probably the factor of chief importance, for in areas of somewhat uncertain rainfall the essential precautions are (1) to absorb and retain as great a proportion of the precipitation as possible, and (2) to be prepared to plant immediately the state of the land and the weather conditions seem to warrant it.

Neither of these provisos can be complied with by the farmer who awaits the first soaking rains of the season before commencing to plough and prepare his lands.

Experience on this station would indicate that, providing the land has been well ploughed and is in good tilth and is subsequently cultivated to conserve the moisture, an inch of rain early in December will tide the maize crop over a period of three weeks without further rain.

The relative yielding powers of the four leading varieties are in line with the results of similar trials carried out at Gwelo and Salisbury, and show that there is practically no difference in yield in favour of any of the four varieties.

MAIZE VARIETY TRIALS.

Analysis of yields to date, in bags.

Variety.	Season 1922-23 rainfall, 33.22 in.	Season 1923-24 rainfall, 14.44 in.	Season 1924-25 rainfall, 45.07 in.	Season 1925-26 rainfall, 21.54 in.	Season 1926-27 rainfall, 13.09 in.	Season 1927-28 rainfall, 14.62 in.	Season 1928-29 rainfall, 33.66 in.	Average yield, 7 years.
Louisiana Hickory ...	7.60	14 00	13.00	9.47	7.20	1.88	8.44	8.80
Hickory King ..	6.50	13.60	12 80	10.44	6.83	0.76	8.47	8.48
Salisbury White ...	6.20	14.60	12 90	8.44	7.36	0.99	8.69	8.45
Potchefstroom Pearl	5.30	14.60	13.50	8.36	8.65	1.27	7.12	8.40
Yellow Flint	5.30	9.60	6.30	8.38	6 82	6.22	3.85	6.64
American W. Flint ...	...	...	...	8.52	7.20	4.94	4.65	6.33 (4 yrs.)
Sahara Yellow ...	7.10	...	6.80	...	...	...	...	...
Golden Beauty ...	...	5.20	8.50	...	...	...	...	...
Krug Corn	...	...	...	3.20	...	...	...	...
Wisconsin White ...	...	13 90	...	...	...	...	...	...
Iowa Silver Mine ...	..	...	10.40	...	...	...	...	...
Eureka	7.40	...	...	...	...	...	...	...
Texas Hickory ...	5.80	...	...	...	...	...	...	...
Menne	5.80	...	...	...	...	...	..	...
German Yellow ...	5.70	12 20	...	...	...	...	...	...
Yellow Cango ...	5.25	...	...	...	...	...	...	...
Pride of Saline ...	3.70	...	...	...	...	...	...	...
Minnesota No. 133 ...	3.75	...	...	...	...	...	...	...
Date of planting ...	8.1.23	21.12.23	...	13.12.25	16.12.26	6.12.27	31.12.28	

YIELD OF GREEN FODDER PER ACRE.

Season 1921-22. *Rainfall* 12.48 *inches.*

Variety.	Yield.
Hickory King	5,880 lbs.
Louisiana Hickory	5,488 lbs.
Potchefstroom Pearl	5,456 lbs.
Salisbury White	5,152 lbs.
Botman (Flint)	4,520 lbs.

Owing to the rawness of the land and to the ploughing of the station, which was done very late in 1921, coupled with the very severe drought experienced the first season, the varieties in 1921-22 were all reaped for silage. That season the Botman variety, a quick maturing and reputed hardy breed, produced no better yield of grain and a considerably lighter crop of fodder than the standard Rhodesian varieties.

DISTANCE PLANTING TRIALS.

Spanish Bunch Ground Nuts.

Yield in lbs. per acre of nuts.

Distance planted.	1928-29	1927-28	1926-27	1925-26	1924-25	1923-24	1922-23	Average yield.
Inches.								
36 × 9	...	...	...	...	...	...	720	720
36 × 6	...	...	...	...	...	...	756	756
30 × 8	...	836 2,496 lbs. green tops	1,220	...	2,128	1,332 1,608 lbs. green tops	...	1,379
30 × 5	2,384	...	...	...	...	...	...	2,384
28 × 8	...	...	...	1,280	...	...	...	1,280
24 × 10	...	...	...	...	...	1,008 1,620 lbs. green tops	...	1,008
24 × 8	...	...	1,580	...	2,264	...	...	1,922

GROUND NUT VARIETY TRIALS.

Variety.	Yield per acre, 1928-29.	Yield per acre, 1925-26.	Average yield per acre.
	Lbs.	Lbs.	Lbs.
Spanish bunch	2,384	1,280	1,832 (2 yrs.)
Virginia runner	...	1,064	1,064 (1 year)
Japanese bunch	...	960	960 ,,
Jumbo	...	532	532 ,,
Virginia bunch	804	532	668 (2 yrs.)

CROPS FOR HAY OR FODDER.

Yield in lbs. per acre.

Crop.	Season 1928-29 rainfall, 33.66 in. Green weight.	Season 1927-28 rainfall, 14.62 in. Green weight.	Average yield to date	Period.
				Years.
1. Oats (Kinvarra)	4,448	failed	2,948	5
1. Oats (Kherson)	4,816	,,	3,154	5
Oats and Sudan grass ...	not grown	not grown	7,084	1
Boer manna and Sudan grass	,, ,,	,, ,,	5,176	1
2. Boer manna	6,444	failed	4,115	4
Sudan grass	6,000	no record	5,620	4
3. Teff	4,416	failed	2,968	4
Ground nut (tops)	no record	2,496	2,469	3
Wedge pea and oats	9,008	not grown	9,008	1
Soya bean and oats	8,400	,, ,,	8,400	1
Dolichos bean	18 042	11,260†	11,364	5
Velvet bean	20,520	7,801†	10,160	5
Cow peas (common Iron) ...	no record	5,714†	7,146	4
,, Whipporwill ...	not grown	not grown	9,370	2
Wedge pea	7,296	,, ,,	...	...

† Average of two or more plots.
1. Failed two seasons out of five owing to drought.
2. Failed two seasons out of four owing to drought.
3. Failed one season out of four owing to drought.

YIELDS OBTAINED IN THE ROTATION PLOTS.

Crop.	Season 1928-29 rainfall, 33.66 in. Green weight.	Season 1927-28 rainfall, 14.62 in. Green weight.	Average yield to date.	Period.
				Years.
Velvet beans, 1st series ...	9,517	6,882	11,018	6
,, ,, 3rd ,, ...	33,240	7,688	12,907	5
,, ,, 4th ,, ...	38,040	8,308	13,566	5
Cow peas 3rd ,, ...	9,326	4,584	7,093	5
,, 4th ,, ...	8,804	7,872	7,472	5
Sudan grass, 1st series, first cutting	10,848	15,136	8,980	6
second cutting	...	...	2,758	3

MISCELLANEOUS GRAIN AND FODDER CROPS.

Yield in lbs. per acre.

Crop.	Season 1928-29.	Average yield to date.	Period.
			Years.
Sunflower, black	460	913	5
Kaffir corn—			
Bird-proof	...	805	4
White	...	314	5
Drought resistant (ex Union)	960	960	1
Buckwheat	816	493	2
Linseed—			
Large seeded	...	207	3
White flowered	133	285	6

LEGUMES FOR GRAIN.

Yield in lbs. per acre.

Crop.	Season 1927-28.	Average yield to date.	Period.
Velvet beans—			Years.
White	...	713	5
Florida	...	525	3
S. Taborense	...	375	1
Tracey's Early Black	428	428	1
Osceola...	244	244	1
Dolichos beans—			
Brown	...	435	5
Cow peas—			
New Era	708	702	2
Common Iron	420	547	6
Whipporwill	255	456	5
Iron	...	150	1
Victor	...	105	1
Brabham	...	225	1
Monetta	...	90	1
Kaffir pea...	...	506	2
Sunn hemp	306	407	6
Wedge pea	476	476	1
Soya beans—			
Laredo	384	384	1
Haberlandt	280	280	1
Tepary bean	...	181	3
Dhal	...	325	3
White Jack bean ...	...	700	1

SWEET POTATOES.

Sweet potatoes from tubers left in from previous year.

Yield in lbs. per acre.

Season.	Variety.	Tubers.	Green tops.	Average yield over 5 years. Tubers.	Average yield over 5 years. Green tops.
1925-26	Calabash leaf	13,380	9,820	9,356	19,702
1926-27	,, ,,	4,980	15,720	...	...
1927-28	,, ,,	2,046	22,692	...	...
1925-26	Early butter	19,040	10,940	...	...
1926-27	,, ,,	12,480	9,220	13,514	14,278
1927-28	,, ,,	7,331	23,157	...	...
	Sweet potatoes established from cuttings (same season).				
				Average yield, 4 years.	
1925-26	Calabash leaf	Not lifted	1,420	...	7,996
	Early butter	,, ,,	1,540	...	5,832

The Early Butter variety, by reason of its shorter growing period, is much the heavier yielder of tubers, and since its combined weight of both tubers and tops is about equal to that of the Calabash Leaf variety, it would appear to be the more suitable variety to grow as a stock feed in Matabeleland. The results further indicate the advisability of leaving the crop down for two seasons as against endeavouring to secure a full yield the first season.

SILAGE AND SUCCULENT CROPS.

All crops sown 12/1/29 and 21/1/29.

Yield in lbs. per acre (green fodder).

Crop.	How sown.	Yield per acre, 1928-29.	Average yield to date.	Period.
	Inches.			Years.
Sunflower plus velvet beans ...	36 × 9 (same row)	21,638	17,126	6
Sunflower plus velvet beans ...	20 × 18 (alternate rows)	not grown	16,339	4
Sunflower alone	30 × 12	19,440	20,107	6
Maize plus velvet beans ..	36 × 9 (same row)	19,096	12,468	6
Maize plus velvet beans ...	20 × 18 (alternate rows)	not grown	13,570	4
Maize alone	30 × 12	15,552	14,122	6
Kaffir corn plus velvet beans ...	36 × 9 (same row)	10,540	8,721	3
Kaffir corn plus velvet beans ...	20 × 9 (alternate rows)	not grown	14,216	3
Kaffir corn alone	30 × 9	not grown	10,664	5
Maize plus cow peas	36 × 9 (same row)	12,772	12,772	1
Kinvarra oats plus Soya bean ...	Broadcast	8,400	8,400	1
Kinvarra oats plus wedge pea ...	Broadcast	9,008	9,008	1

In 1928-29 all crops, with the exception of oats, plus soya beans and oats, plus wedge pea, received a dressing of 100 lbs. superphosphates per acre.

POTATOES.

Planted 29/12/27.

Yield per acre in bags.

Season: 1927-28.
Rainfall: 14.62 inches.

Variety.	Yield.
	Bags.
Up-to-date	26.5 (no treatment)
Great Scott	26.4 ,, ,,

Season: 1928-29.
Rainfall: 33.66 inches.

Variety.	Treatment.	Yield.
		Bags.
Up-to-date ...	Plus 200 lbs. double complete potato fertiliser per acre	42.8
Great Scott ...	As above	49.8
Up-to-date ...	Plus 10 tons farm manure, plus 200 lbs. double complete potato fertiliser per acre	66.1
Great Scott ...	As above	81.4

MAIZE FOLLOWING GREEN MANURE CROPS.

Maize plus 200 lbs. superphosphates per acre, after legumes reaped, after maize plus fertiliser.

Plots 18 A and B, 19 A and B and 10 A.

Each plot is half an acre in area.

Maize yields in bags per acre of the fourth maize crop.

Plot No.	Preceding crop.		Plot No.	Maize crop.	
	Season 1927-28.	Yield.		Season 1928-29.	Yield.
		Lbs.			Bags.
18 A	Dolichos beans	13,500 (green fodder)	18 A	Maize, after dolichos beans reaped ...	16.62
18 B	Niger oil ...	52	18 B	Maize, after Niger oil reaped ...	19.33
19 A	Velvet beans	8,550	19 A	Maize, after velvet beans reaped ...	17.78
19 B	Cow peas ...	4,842 (green fodder)	19 B	Maize, after cow peas reaped	18.41
10 A	Sunn hemp ...	306	10 A	Maize, after Sunn hemp reaped ...	19.23

Talks to Poultry Keepers.

GRIT, SHELL AND CHARCOAL.

THEIR ABSOLUTE NECESSITY AND IMPORTANCE.

By The Poultry Officer.

Many will say that it is quite unnecessary to give any advice on the above; to some poultry keepers it may be so, but to a very large number it is necessary. Really the ignorance of many, who are keeping fowls and have done so for some time, on these necessary adjuncts to poultry keeping is astounding.

Grit.—As we all know, fowls have no teeth, and the food they eat must be broken up and macerated before it can be properly digested and its constituents assimilated; therefore they must be supplied with something to perform this necessary function, and grit is the substance.

Any hard, sharp stones, whether it be flint, which is the hardest and usually the sharpest, quartz, granite or diorite, are suitable. Gravel with round edges, which I have often seen given, is of no use whatever. Sand is worse, as it does not grind up the food sufficiently, and especially when given to young chicks causes impaction of the intestines. I have often made post mortems on chicks whose stomachs, gizzards and intestines were full of it, and death has been due to irritation of the intestinal canal, indigestion and starvation due to the chick not digesting its food and obtaining little or no nutriment from it.

The results of lack of grit are indigestion, sour crop, general debility, emaciation and death.

Grit for newly-hatched chickens should be the same size as munga (inyouti). For chicks from one month to three months it should be the same size as a small wheat grain. For those from three months to five months, that of a buckwheat grain. For adults, from the size of a large wheat grain to that of a mealie grain. The size for ducks is the same as above. The birds themselves know only too well how necessary good, sharp grit is for their well being, and if not given it they will swallow pieces of broken china or glass if these are available. I have frequently found these in the gizzard, and the edges worn down smoothly in the process of maceration. If suitable grit is withheld for some days and then supplied, the birds will immediately swallow a large quantity. There is no excuse for the absence of grit in the grit boxes; some hard stones are always available, ready for breaking up and sifting.

Shell.—This supplies carbonate of lime for the manufacture of the egg shell.

It will, therefore, be evident that anything (not necessarily oyster shell) which contains carbonate of lime is suitable, e.g., ordinary sea shell, clam shell, which is most suitable, as it is hard and sharp, thus acting to some extent also as grit; it is very clean, not wasteful, and contains a large proportion of carbonate of lime. Slaked lime or ordinary lime water answers the purpose well, but it must be well slaked; that which is left (the rubble) at the bottom of a bucket after lime washing is quite good. I have known unslaked lime to be given; needless to say, death results, as anyone with any common sense would know.

If shell is withheld, one may expect soft eggs from the birds that are laying, and often rickets, leg weakness and crooked breast bones in growing birds. Oyster shell that is soft, flaky and powdery is wasteful and not much good, and that which is dirty is positively dangerous, causing, as it sometimes does, enteritis.

Charcoal is a blood purifier, deodoriser and germicide; it also assists largely in digestion, and is most necessary for

keeping the birds in good health. It should be clean, well prepared and of suitable sizes, i.e., similar to those given above for grit.

If charcoal is not present the result is sour crop, fermentation in the intestinal tract, especially in turkeys, gastritis (inflammation of the stomach), indigestion and chronic enteritis (inflammation of the intestines), and poor health of the birds generally.

Poison Bait for Birds.

The following notes, which appeared in the Rhodesia Agricultural Journal *of October,* 1920, *are reprinted in response to applications for information on the subject of destroying grain-eating birds.*

Obtain from the chemist one ounce of powdered strychnine alkaloid. Take two cupfuls of dry laundry starch or three large cupfuls of wheat flour, mix it with a little cold water, then add enough boiling water to make one-half gallon (three bottles) of paste and cook for a few minutes until the paste is clear, stirring continually. Then stir in the strychnine powder. Pour this poison paste over 40 or 50 pounds of small grain, such as kaffir corn, mix thoroughly so that every kernel of grain is coated with the paste. Then spread the grain out and let it dry. After being dried it can be kept indefinitely and used when desired. Fifty pounds is enough bait to last for a long time.

Burn small patches of ground and scatter unpoisoned grain on these. After it is found that this grain has been eaten, the poisoned grain can be used.

Caution: The patches of ground should be some distance from the house, otherwise the poultry may be killed. Remember to use great care in handling strychnine. It is very poisonous and dangerous, and a very small dose will kill a man.

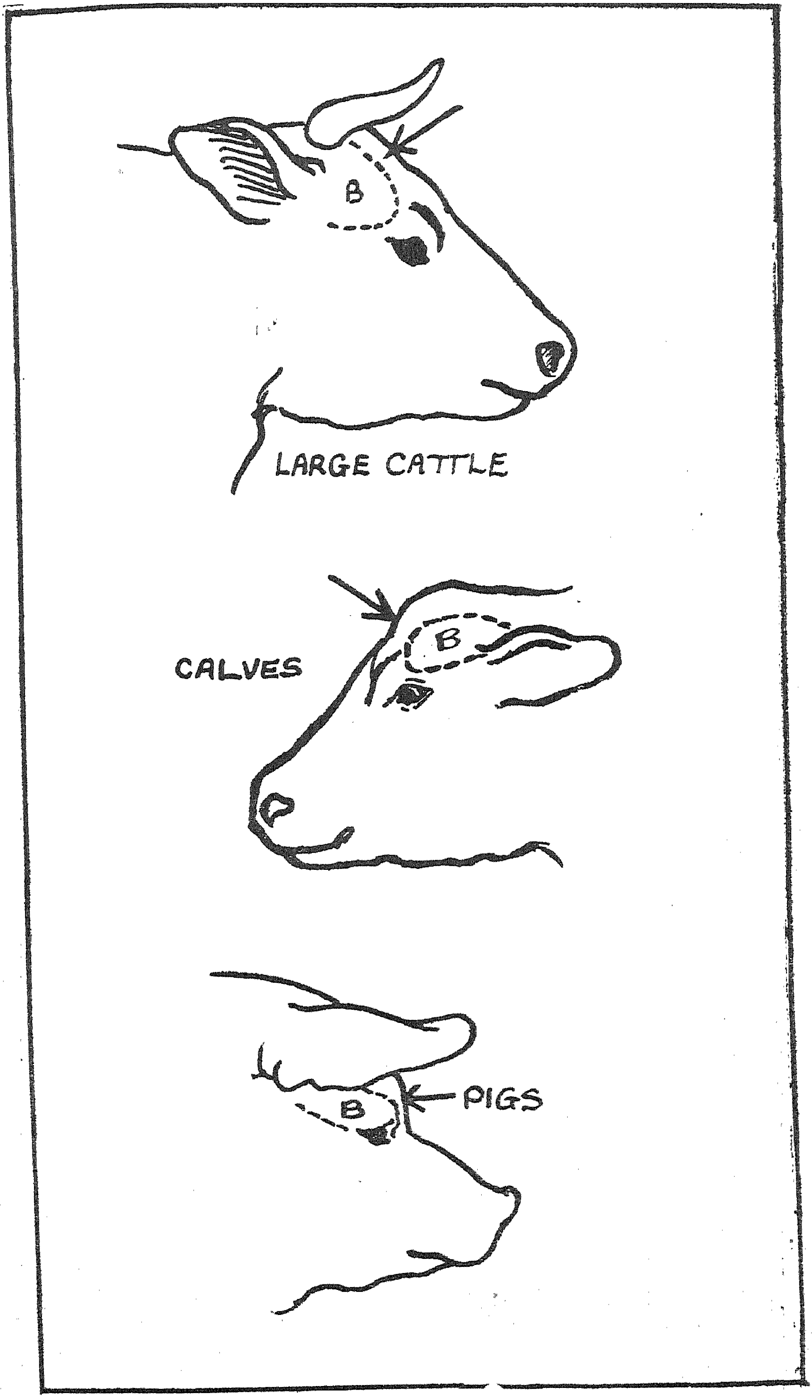
Humane Killing of Stock on Farms and at Country Stores in Southern Rhodesia.

By Lieut.-Col. E. Hope Carson, D.S.O., M.C., Honorary Representative in Southern Rhodesia of the Model Abattoir Society.

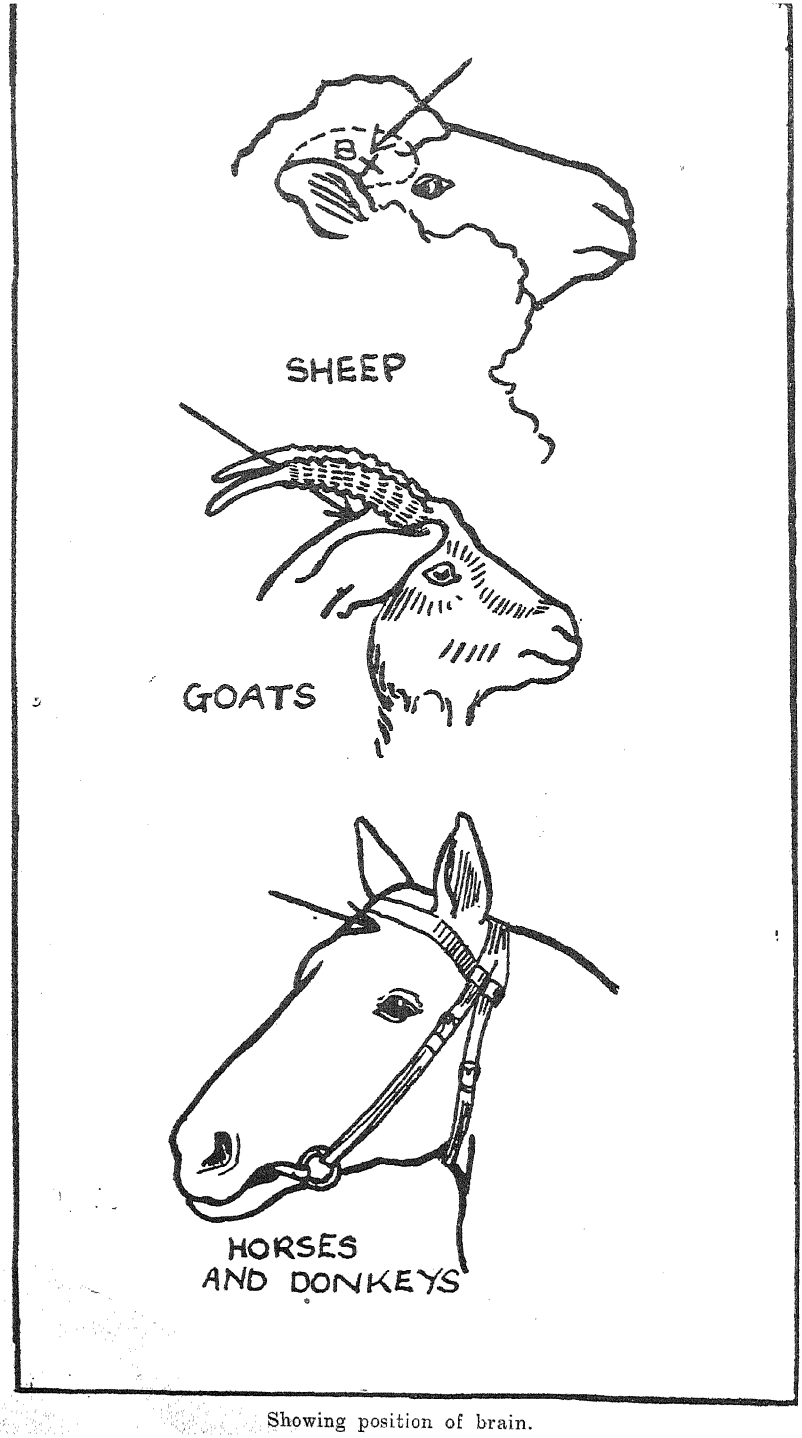
Undoubtedly at some farms and trading stores methods of slaughtering leave much to be desired. Cases need not be quoted, but in those brought to notice the unsatisfactory methods employed have been due to the killing being entirely left to natives. In one case the farmer immediately closed the butchery at his trading store on hearing what was taking place there. Those who know the native may agree that he is often callous when dealing with animals, and quite unconscious of sufferings he may inflict, particularly when animals have to be killed. and it seems that the only way to prevent this is for the farmer to be present on all occasions.

No animal should be killed unless first stunned. This is the law in Scotland, and a Secretary of State has stated in the House of Commons that it is intended to apply it to the whole of the British Isles. A model bye-law, drafted by the Minister of Health, which has been adopted by over 200 towns, urban and rural councils in England, will assist in explaining modern methods of slaughtering, and this reads:—

> "A person shall not in a slaughter house proceed to slaughter any animal until the same shall have been effectually stunned, and such stunning shall be effected with a mechanically-operated instrument suitable and sufficient for the purpose."



Showing position of brain.



Showing position of brain.

The mechanically-operated instrument mentioned is generally known as the "humane killer," of which there are various patterns on the market. They may be divided into two groups, (a) those on the lines of a modified pistol, (b) those in which a striker or bolt, called a captive bolt, is propelled by a blank charge, the withdrawal being part of the mechanism of the instrument. This is the more popular form.

The pole-axe, hammer or "pithing" methods cannot compare with the humane killer for large stock, but it may not be necessary to deal with this point at any length, as if only for the sake of convenience the use of this weapon for bovines is likely to appeal. "Pithing," a method common in South Africa, has been pronounced by the Veterinary Officer for the City and Council of Newcastle-on-Tyne to be "an objectionable practice and should be prohibited," as the animal, after falling, may remain conscious.

The certainty of the humane method may be gathered from the following figures, which were included in a report furnished by the Medical Officer of Health and the Veterinary Surgeon to the City of London and the Superintendent of the Metropolitan Cattle Market. As the result of observations made of what may be called the old method, they found it took 655 blows to bring down 400 animals, while in using the humane killer only 194 shots were required to deal with 190. In another trial extending over several days, 1,259 shots from the humane killer dealt with 1,255 animals. Of the four failures, cartridges were defective in two instances. In those trials animals of all classes were used.

The advantages of a specially designed instrument can be easily understood, especially in cases where a number of animals are slaughtered or where the slaughtering takes place in a room or confined space. On a farm or at a country store cattle are not killed in numbers, and the person concerned might not feel inclined to go the length of providing himself with special instruments, but at such places a rifle or revolver could generally be used without danger.

The sketches given show the direction the bullet or bolt should take when using a humane killer but can be taken as a guide when a rifle or revolver is used.

Although it may be accepted that the humane killer, rifle or revolver, if correctly directed, must kill, they should be considered stunning instruments, and bleeding should immediately follow, as on efficient bleeding depends the quality of the meat. The knife should be used before any reflex movements take place. To drain the blood from the head of a pig the nose should be cut.

Much suffering can be given to animals about to be slaughtered while handling them. On a farm a great deal of this can be avoided, as there is not likely to be the pressure of time necessary in a factory or public slaughter house, and therefore opportunities for the favourable moment in which to shoot can be waited for. The writer has seen large stock successfully shot in the open and knows of one farmer who deals with this class with a revolver while they are standing in a pen. The farmer is not likely to have many animals to deal with at the one time and can wait for the opportunity to shoot to present itself.

I would like to put in a special plea against the use of the knife on sheep and pigs before stunning. As regards sheep, I would quote two authorities. A lecturer before the Medical Society of London said: "In the case of sheep killed with the knife, death is comparatively severe. The thrust of the knife is a keen penalty, and the process of breaking through the vertebrae, though it shortens agony, is a violent and evidently excruciating procedure." Professor Starling, in his evidence before an Admiralty Committee, said that in the hands of an expert this method was fairly rapid but somewhat uncertain, the time that lapsed between the first thrust of the knife and complete loss of insensibility varying, according to his observations, from five to 50 seconds. In the hands of an expert operator it might be some time before death supervened, and there could be little doubt that the method must be very painful to the sheep so long as consciousness remained. At the best, it was a somewhat difficult operation, yet in practice it was often entrusted to the younger and more inexperienced hands, the probable reason being that sheep were easy to handle and did not struggle or give trouble when "stuck."

In cases where the slaughtering is left to natives without supervision, the position would be even more unsatisfactory

than that referred to by Professor Starling, who was speaking of European slaughtermen.

The shooting of sheep requires consideration. They can be shot standing if the captive bolt is used, but this is not recommended when using the pistol. Some of the instructions given by the S.P.C.A. (London) for the use of the humane killer on this class of animal may be quoted, and the farmer could consider the extent to which he could apply them in using a revolver. In reading these instructions, the sketch should be followed. Lay the sheep on its left side. Place the muzzle of the instrument in the hollow on the upper side of the face, about equal distance from the eye and the ear, as shown by the circle. Steady the head of the sheep by holding the nose, point the instrument towards the left shoulder and fire. With horned sheep, shoot just above the eyes, pointing towards the spine.

The methods that cover the direct use of the knife on pigs need not be gone into, but generally speaking the animal suffers much, whatever the method may be. The humane killer is particularly suitable for pigs, and in parts of England and many countries in the north of Europe this instrument is used in conjunction with the Schermer pig trap, which enables three pigs a minute being dealt with without handling until unconscious.

The brains of horses, mules and donkeys being in the upper part of the head, the centre immediately below the brow band is a safe guide in shooting.

While the use of the rifle or revolver is far preferable to using the knife, nothing can exceed the effectiveness of the specially designed "humane killer," and the satisfaction to be derived from its use would repay the man with only an animal to kill occasionally. Whatever the method adopted, the use of the knife, even in the hands of the most skilled, without previous stunning is to be deprecated.

Importation of Citrus Trees into Southern Rhodesia.

It is hereby notified that His Excellency the Governor-in-Council, under and by virtue of the powers conferred on him by the "Importation of Plants Regulation Ordinance, 1904," has been pleased to cancel Government Notices Nos. 87 of 1919, 256 of 1919, 243 of 1922 and 13 of 1929, and to declare that from and after this date the importation into Southern Rhodesia of citrus trees or any part thereof, including fruit, seed, seedling trees, cuttings, branches, leaves and budwood, is prohibited, except as provided hereunder:—

1. Citrus fruit may be imported without restriction from Northern Rhodesia and Nyasaland, provided it is the product of these countries.

2. The importation of citrus trees, including budwood or other part for propagation, shall be limited to introductions made under special permit from the Minister of Agriculture and Lands, Salisbury, who may grant or withhold such permit at his discretion, and may attach such conditions to the importation as he shall deem desirable.

3. Permits shall only be granted under section 2 in respect to special varieties or strains which—

(1) are not procurable in Southern Rhodesia; and

(2) are judged likely to be of benefit to citrus culture if introduced to the Colony.

The decision of the Minister in respect to the foregoing shall be final.

4. Conditions attached to permits granted under section 2 shall include the following:—

(a) The consignment shall be accompanied by a certificate signed by a responsible official of the Plant Regulatory Service or other recognised institution in the country concerned, to the effect that the nursery or plantation from which the

trees, budwood or other parts were taken was adequately inspected at a date not more than three calendar months prior to despatch of the consignment and was apparently free at that time from serious insect pests and plant diseases, with special reference to the disease known as citrus canker (*Pseudomonas citri*).

The certificate shall also state that citrus canker is not known to have occurred at any time within one hundred miles of the said nursery or plantation.

(b) In the case of importations from the Union of South Africa, permits shall not be issued in respect to nurseries and plantations outside the provinces of the Cape Colony and Natal.

(c) Citrus trees, including budwood or other part for propagation, when imported shall be planted or propagated only in an isolated situation, approved by a qualified officer of the Department of Agriculture, and shall be kept in quarantine with due supervision for a minimum period of three years.

(d) The period of quarantine shall be terminable after three years at the discretion of the Minister.

(e) Unauthorised removal from the quarantine area of citrus trees or any part thereof, including budwood, fruit, seed, cuttings, branches and leaves, during the period of quarantine shall constitute an offence and shall render the whole of the trees under quarantine liable to immediate destruction.

5. Transit through Southern Rhodesia of citrus trees, fruit, budwood and other parts for propagation is permitted, provided that, in the case of trees and parts for propagation, a certified copy of the permit to import the said trees or parts into the country to which they are consigned is received at least two weeks in advance by the Secretary, Department of Agriculture, Salisbury, and, furthermore, that the importation is not inconsistent with the intention of the foregoing regulations.

6. Any person contravening these regulations shall be liable on conviction to a fine not exceeding £10. (G.N. No. 744 of 27th December, 1929.)

Southern Rhodesia Weather Bureau.

DECEMBER, 1929.

Pressure.—Barometric pressure was generally low, the highest being Fort Victoria with 0.017 in. below normal, and the lowest Bulawayo with 0.052 in. below normal. Only one high of importance was recorded during the month. It appeared on the south coast on the 8th and 9th, and moved up the east coast, being off Beira on the 11th and 12th.

Lows were very active. A southerly low moved around the coast on the 1st and 2nd and was well developed at Durban on the 3rd. The equatorial low was active from the 1st to the 10th, when it extended down the west coast; the extension swung round the coast to the 12th, and then withdrew through the borders of Southern Rhodesia. The extension was immediately recommenced and a trough to the south-west coast was established on the 16th; this swung slowly round the coast and passed through Southern Rhodesia on the 20th and 21st. A trough developed on the 22nd, but broke up rapidly. The next trough developed on the 26th, with a very shallow depression; on the 28th it extended to the south-west coast and commenced to move. On the 31st it extended into Southern Rhodesia, with a deep low on the south-east coast.

Temperature.—The mean temperature for the month was low, varying from 4.8° F. below normal at Riverdene North to 1.0° F. above normal at Sipolilo. The mean maximum temperatures were very low, varying from 9.1° F. below normal at Riverdene North to 0.8° F. above normal at Sipolilo. The mean minimum temperatures were slightly below normal, varying from 2.0° F. above normal at Melsetter to 2.2° F. below normal at Gatooma. The mean relative humidity was generally high.

Rain Periods.—Rain fell in two periods, from the 1st to the 10th and from the 16th to the 23rd. On the 1st showers were general in Mashonaland, and on the 2nd light showers were fairly general. On the 3rd scattered showers fell in north-eastern Mashonaland; on the 4th showers were general in Mashonaland, with scattered showers elsewhere; on the 5th scattered showers only were recorded. On the 6th showers were fairly general in the south, extending to general over the country on the 7th, 8th and 9th. On the 10th showers were fairly general in the north, with isolated showers on the 11th. On the 12th showers fell in Matabeleland, and on the 13th in western Matabeleland and the Midlands; on the 14th and 15th isolated showers fell. On the 16th and 17th showers were fairly general, becoming general on the 18th to 21st. On the 22nd showers were general, except in the south, and on the 23rd were confined to northern Mashonaland. Showers continued to be recorded in northern Mashonaland up to the end of the month.

Rainfall.—The rainfall for December amounts to 6.02 ins., as compared with the normal of 5.57 ins., the seasonal total to date being 11.24 ins. or 1.49 ins. over normal.

RAINFALL.

Station.	1929. Nov.	1929. Dec.	Total to end of period.	Normal rainfall to end of period.
ZONE A.:				
Bubi—				
Bembesi Railway ...	5.74	4.41	10.15	8.19
Glenarton ...	1.64	...	...	7.18
Inyati ...	9.49	4.94	14.81	8.59
Judsonia ...	4.46	4.00	8.62	n.s.
Martha Farm ...	4.46	4.31	8.90	7.44
Nduba Farm ...	7.01	2.33	9.94	n.s.
Shangani Estate ...	5.49	4.50	10.36	9.38
Bulalima-Mangwe—				
Centenary ...	5.44	3.83	9.81	8.65
Kalaka ...	8.50	...	...	7.67
Riverbank ...	4.25	3.61	8.44	8.94
Solusi Mission ...	4.32	3.85	8.64	8.02
Bulawayo—				
Fairview Farm ...	4.66	...	...	8.49
Keendale ...	8.38	3.82	12.64	7.97
Crowhurst ...	3.89	3.70	7.59	8.33
Observatory ...	4.32	4.14	8.69	9.36
Waterworks ...	3.78	4.03	7.92	8.56
Gwelo—				
Brockenhurst ...	6.89	4.40	11.37	n.s.
Frogmore ...	6.84	...	...	n.s.
Gwelo Gaol ...	6.39	6.81	13.30	10.10
Riversdale Estate ..	...	...	...	9.56
Somerset Estate ...	4.25	3.71	8.07	10.07
Insiza—				
Orangedale ...	4.54	...	...	9.49
Shangani ...	5.42	4.81	10.35	8.67
Thornville ...	3.91	4.33	8.48	8.74
Nyamandhlovu—				
Gwaai Reserve ...	3.07	7.10	10.92	6.79
Gwaai Siding ...	3.73	6.83	10.75	n.s.
Naseby ...	2.75	3.69	6.62	8.44
Nyamandhlovu Railway ...	3.79	3.68	7.47	8.49
Sebungwe—				
Gokwe ...	2.11	8.56	11.13	10.07
Umzingwane—				
Springs ...	4.24	2.61	7.14	8.75
Wankie—				
Dett ...	1.94	10.77	12.93	6.27
Matetsi Railway ...	1.90	7.07	9.15	9.23
Ngamo Railway ...	1.94	6.66	9.08	7.78
Rosslyn ...	3.23	5.21	8.44	n.s.
Sukumi ...	2.35	7.61	10.07	7.24
Tom's Farm ...	3.38	4.61	8.53	n.s.
Victoria Falls ...	2.10	6.80	9.10	n.s.
Victoria Falls Railway ...	1.92	7.28	9.43	10.01
Wankie Hospital ...	.65	6.15	6.88	8.00

RAINFALL—(*Continued*).

STATION.	1929. Nov.	1929. Dec.	Total to end of period.	Normal rainfall to end of period.
ZONE B.:				
Belingwe—				
Bickwell ...	7.37	4.22	12.16	7.54
Sovelele ...	1.68	...	...	4.86
Tamba ...	3.03	..	...	5.82
Wedza ..	2.61	...	...	6.80
Bulalima-Mangwe—				
Bruwapeg ...	2.98	3.73	6.83	6.82
Empandeni ...	3.64	...	...	7.33
Fallowfields ...	3.42	2.67	6.47	n.s.
Garth ...	3.50	2.51	6.43	9.44
Maholi ...	...	...	...	10.26
Retreat ...	3.50	4.15	8.46	7.92
Sandown ...	3.56	3.61	8.35	9.17
Semokwe Reserve ...	2.49	4.15	7.03	n.s.
Tjankwa ...	3.60	2.36	6.48	10.91
Tjompani ...	3.04	7.65	11.04	9.20
Chibi—				
Bubye ...	3.97	...	...	4.85
Mtendelende ...	6.22	...	...	5.39
Nuanetsi Homestead ...	3.64	3.81	7.65	4.95
Nuanetsi N.C. ...	4.78	...	...	n.s.
Gwanda—				
Gwanda Gaol ...	3 80	1.66	5.75	7.71
Limpopo ...	2.53	...	...	5.39
Mazunga ...	2.45	...	...	6.89
Mtetengwe ...	2.63	1.67	5.42	4.40
Tuli ...	4.02	4.42	9.67	5.78
Insiza—				
Albany ...	5.20	3.85	9.86	8.92
Filabusi ...	5.27	2.27	8.00	7.83
Fort Rixon ...	4.66	5.28	10.11	8.26
Inyezi ...	5.28	3.83	9.56	7.38
Lancaster ...	4.92	2.35	7.69	6.57
Scaleby ...	4.37	3.52	8.19	n.s.
Wanezi Mission ...	5.15	5.18	10.73	n.s.
Matobo—				
Bon Accord ...	4.93	1.13	6.27	n.s.
Fort Usher ...	3.01	3.32	6.87	n.s.
Holly's Hope ...	5.49	2.09	7.83	6.55
Longsdale ...	4.49	3.73	11.09	n.s.
Matopo Mission ...	4.58	2.94	8.49	8.81
Mtshabezi Mission ...	4.28	2.00	6.44	7.86
Rhodes Matopo Park ...	3.20	2.96	8.20	9.15
Umzingwane—				
Balla Balla ...	4.75	...	...	8.45
Essexvale ...	6.31	3.78	10.18	8.03
Hope Fountain ...	5.07	4.90	11.30	9.31

RAINFALL—(*Continued*).

STATION.	1929.		Total to end of period.	Normal rainfall to end of period.
	Nov.	Dec.		
ZONE C.:				
Charter—				
Bushy Park ...	3.13	6.55	9.68	10.98
Enkeldoorn ...	4.09	...	...	10.96
Marshbrook ...	8.16	8.22	17.37	10.76
The Range ...	5.64	8.43	15.59	10.93
Vrede ...	6.61	5.93	13.14	11.55
Chilimanzi—				
Beacon Hill ...	4.49	6.88	11.47	8.81
Central Estates ...	5.64	5.87	11.87	12.22
Fourie's Post ...	2.70	5.15	7.85	8.39
Orton's Drift ...	5.55	7.69	13.24	9.43
Sebakwe Post ...	4.87	6.59	11.46	9.57
Umvuma Railway ...	3.80	6.26	10.26	10.49
Gwelo—				
Cross Roads ...	4.20	4.46	8.72	10.58
Delano Estate ...	2.21	7.70	10.01	n.s.
East Clare Ranch ...	3.62	6.11	9.97	8.32
Forestvale ...	4.35	...	...	n.s.
Globe and Phœnix Mine ...	7.95	3.87	12.25	10.07
Lannes Farm ...	5.71	4.96	10.80	n.s.
Lalapanzi ...	5.05	5.41	10.65	12.74
Lyndene ...	6.92	...	...	8.72
Woodendhove ...	4.49	...	...	10.30
Wold Farm ...	4.16	5.82	10.42	n.s.
Hartley—				
Ardgowan ...	3.88	...	...	11.12
Balwearie ...	1.80	7.79	9.70	10.59
Battlefields ...	3.03	6.81	10.06	10.62
Beatrice ...	4.65	6 35	11.32	11.26
Carnock ...	9.26	6.08	16.47	12.10
Cromdale ...	5.42	7.42	13.65	12.17
Currandooley ...	2.96	8.36	11.56	n.s.
Eiffel Blue Mine ...	4.94	5.63	10.59	9.00
Elvington ...	6.06	9.43	15.85	11.37
Gatooma ...	4.11	5.07	9.41	11.13
Cotton Breeding Station ...	4.28	6.05	10.65	n.s.
Gowerlands ...	5.42	9.05	15.03	11.14
Handley Cross ...	2.86	4.71	7.79	n.s.
Hartley Gaol ...	6.61	6.03	13.62	11.44
Hopewell ...	6.21	10.37	17.08	11.33
Jenkinstown ...	5.65	7.42	14.03	11.56
Maida Vale ...	2.89	6.06	9.29	9 37
Meadowlands ...	4.43	8.71	14.08	n.s.
Nyadgori ...	4.88	...	...	11.69
Pulham ...	5.10	8.26	15.57	12.74
Ranwick ...	7.90	8.28	16.50	11.86
Sunny Bank ...	2.45	...	...	n.s.
Thorndyke ...	4.84	...	...	10.82

RAINFALL—(*Continued*).

Station.	1929. Nov.	1929. Dec.	Total to end of period.	Normal rainfall to end of period.
Zone C.—(Continued)				
Lomagundi—				
Argyle ...	5.94	4.97	12.21	11.41
Baguta ...	3.10	5.94	10.31	10.59
Between Rivers ...	3.23	7.06	11.67	n.s.
Citrus Estate ...	1.46	7.10	9.98	10.83
Strathdon ...	2.80	6.17	11.54	n.s.
Darwendale ...	4.66	5.46	12.04	10.45
Dedsi ...	2.85	6.75	10.90	10.29
Dingley Dell ...	2.49	5.26	8.18	8.74
Gambuli ...	1.65	3.85	8.11	11.47
Kapiri ...	5.34	6.06	11.78	10.57
Kashac ...	5.54	4.86	10 46	n.s.
Kenidia ...	4.62	3.23	9.60	n.s.
Mafoota ...	3.58	9.07	13.85	10.45
Maningwa ...	3.04	...	...	11.85
Miami ...	4.83	4.22	9.67	n.s.
Mica Field ...	2.15	4 02	6.34	7.41
Montrose ...	6.65	4.43	12.65	10.30
Mpandegutu ...	3.10	7.59	12.49	10.30
Msina ...	3.86	4.61	9.67	n.s.
Mukwe River Ranch ...	5.32	...	...	10.24
Nyapi ...	2.53	4.37	9.06	9.77
Nywari ...	2.09	5.43	9.62	9.88
Nyati ...	2.73	...	...	9.21
Palm Tree Farm ...	4.30	6.67	12.55	10.36
Pendennis ...	5.50	4.75	10.69	n.s.
Raffingora ...	...	...	...	9.71
Renardia ...	3.82	7.43	13.73	10.39
Richmond ...	5.05	6.94	12.64	9.13
Robbsdale ...	5.41	5.99	11.44	n.s.
Romsey ...	...	...	...	10.52
Silaler Estate ...	2.48	6.08	9.88	11.96
Sinoia ...	3.37	5.15	9.58	11.03
Sipolilo ...	1.91	10.10	12.01	10.08
Umvukwe Ranch ...	4.67	8.28	13.00	11.85
Woodleigh ...	2.72	4.97	10.60	10.57
Yeanling ...	5.72	4.07	11.22	11.49
Zebra Vlei ...	6.49	3.15	10.90	9.97
Marandellas—				
Rocky Spruit ...	8.10	...	...	16.60
Mazoe—				
Pembi Ranch ...	3.03	10.32	13.52	n.s.
Salisbury—				
Avondale (Broadlands) ...	3.42	6.54	10.84	12.29
Ballineety ...	4.12	6.47	11.81	10.59
Botanical Experiment Station	5.12	7.24	13.23	11.51
Bromley ...	7.15	9.44	18.09	11.99
Cleveland Dam ...	6.41	7.67	14.54	10.80
Forest Nursery ...	5.15	7.83	13.52	11.71
Gwebi ...	3.83	6.41	11.23	10.88

RAINFALL—(*Continued*).

STATION.	1929. Nov.	1929. Dec.	Total to end of period.	Normal rainfall to end of period.
ZONE C.—(Continued)				
Salisbury (continued)—				
Salisbury Agricultural Dept.	4.77	6.59	12.23	11.72
Sebastopol ...	5.18	7.24	13.84	11.70
Stapleford ...	4.24	5.11	10.76	11.86
Tobacco Experiment Station	4.95	6.40	13.49	12.16
Western Commonage ...	4.56	5.54	12.08	9.94
Sebungwe—				
Sikombela ...	2.58	...	...	10.47
Wolverley ...	2.02	...	...	8.90
ZONE D. :				
Darwin—				
Cullinan's Ranch ...	3.68	10.36	14.04	7.87
Mount Darwin ...	3.94	...	...	10.18
Rusambo ...	4.92	6.89	10.94	n.s.
Inyanga—				
Inyanga ...	3.90	8.30	13.64	11.94
Juliasdale ...	5.81	13.98	21.90	12.38
Rhodes Estate ...	6.65	8.36	16.14	13.05
Makoni—				
Ardlamont ...	10.40	5.74	16.54	n.s.
Eagle's Nest ...	8.79	5.95	16.28	11 08
Mayo Ranch ...	2.98	10.80	13.97	n.s.
Wensleydale ...	5.97	...	...	10.97
Mazoe—				
Argyle Park ...	4.04	6.42	10.87	11.75
Atherstone ...	4.71	10.05	14.86	9.35
Bellevue ...	3.95	5.86	11.70	10.56
Bindura ...	3.76	6.00	10.16	10.02
Ceres ...	4.77	9.67	15.07	10.81
Chipoli ...	6.35	12.24	19.01	11.19
Citrus Estate ...	4.39	8.47	15.24	11.06
Craigengower ...	3.61	9.53	13.53	11.10
Dandejena ...	2.11	12.94	15.39	n.s.
Donje ...	3.07	11.75	14.96	n.s.
Frogmore ...	3.30	10.90	14.28	10.48
Glen Divis ...	4.12	8.59	13.15	11.57
Glen Grey ...	3.37	6.90	10.85	9.54
Great B ...	3.58	5.89	11.31	11.56
Hinten ...	3.50	...	...	8.44
Horta ...	5.24	9.92	15.18	n.s.
Kilmer ...	4.14	9.32	13.78	11.07
Kingston ...	3.83	10.65	15.08	11.87
Maienza ...	5.44	11.72	18.17	10.54
Marston Farm ...	3.70	7.68	11.79	n.s.
Mazoe Dam ...	4.59	8.46	14.48	10.28
Mgutu ...	3.34	6.20	11.02	13.25
Muripfumba ...	5.03	11.15	16.72	9.40
Omeath ...	6.14	8.78	15.91	10.44

RAINFALL—(*Continued*).

STATION.	1929. Nov.	1929. Dec.	Total to end of period.	Normal rainfall to end of period.
ZONE D.—(Continued)				
Mazoe (continued)—				
Pearson Settlement ...	3.49	4.58	9.33	11.68
Riversdale Estate ...	3.85	4.91	9.91	9.24
Ruia ...	6.46	...	...	10.79
Rustington ...	6.03	11.48	18.22	8.27
Shamva Mine ...	5.65	10.86	17.36	11.27
Stanley Kop ...	5.19	...	6.06	10.38
Sunnyside ...	5.69	8.61	14.83	11.14
Teign ...	4.05	7.31	11.63	11.06
Usk ...	6.07	10.12	16.46	11.15
Virginia ...	...	...	...	10.10
Visa ...	4.60	9.82	14.52	n.s.
Woodlands ...	5.64	...	...	10.55
Zombi Farm ...	5.05	10.54	16.36	12.09
Mrewa—				
Maryland ...	5.33	7.48	15.81	n.s.
Montclair ...	6.50	5.57	14.25	n.s.
Mrewa ...	5.49	7.55	14.27	12.02
Nyaderi Mission ...	6.39	7.68	15.23	9.77
Selous Nek ...	4.86	12.10	17.15	11.80
Mtoko—				
Makaha ...	3.07	9.00	12.12	11.20
Mtoko (N.C.) ...	5.55	16.21	22.01	9.93
Rukore ...	...	...	...	n.s.
Salisbury—				
Arcturus ...	8.05	4.66	14.39	11.47
Chindamora Reserve ...	5.83	5.85	11.99	12.09
Glenara ...	3.49	5.24	8.87	12.24
Goromonzi ...	5.56	4.95	13.17	11.95
Hatcliffe ...	2.71	8.05	11.23	12.10
Hillside (Bromley) ...	5.74	9.93	18.36	12.29
Kilmuir ...	5.48	4.09	10.44	12.37
Meadows ...	7.85	7.17	16.27	12.87
Pendennis ...	2.54	9.75	12.91	n.s.
Selby ...	3.31	6.88	12.09	11.05
Springs ...	5.41	4.30	10.97	11.92
Teviotdale ...	2.69	7.90	11.01	n.s.
Vainona ...	3.28	7.49	11.30	12.35
ZONE E.:				
Belingwe—				
Belingwe (N.C.) ...	6.91	4.30	11.84	7.68
Doro ...	6.02	5.28	11.72	7.33
Shabani ...	2.47	4.05	6.76	5.80
Bikita—				
Angus Ranch ...	2.87	6.75	11.28	6.80
Bikita ...	7.95	5.60	15.44	7.71
Devuli Ranch ...	5.13	4.28	9.41	6.98
Pamushana ...	4.29	...	...	10.69

RAINFALL—(*Continued*).

Station.	1929. Nov.	1929. Dec.	Total to end of period.	Normal rainfall to end of period.
ZONE E.—(Continued)				
Charter—				
Buhera ...	4.09	...	...	12.63
Chibi—				
Chibi ...	7.41	6.67	14.50	7.68
Lundi ...	5.66	...	...	6.24
Mpapas ...	3.55	4.64	9.51	5.16
Chilimanzi—				
Allanberry ...	7.08	5.62	13.85	11.13
Driefontein ...	3.43	3.60	7.37	10.18
Felixburg ...	5.05	...	...	10.03
Grootfontein ...	4.20	5.40	9.60	10.62
Induna Farm ...	3.42	3.11	6.59	11.98
Mtao Forest ...	4.86	4.57	7.94	10.24
Mukowries ...	3.29	3.61	7.64	n.s.
Thornhill ...	3.68	4.07	8.37	n.s.
Gutu—				
Alheit Mission ...	6.31	...	...	9.19
Devuli Store ...	6.82	5.34	13.01	n.s.
Eastdale Estates ...	4.62	8.03	15.10	12.08
Gutu (N.C.) ...	4.44	4.28	10.38	10.26
Glenary ...	5.65	3.01	11.22	9.80
Gwelo—				
Glencraig ...	4.20	...	...	11.59
Partridge Farm ...	5.60	6.54	12.43	11.66
Sheep Run Farm ...	5.07	4.52	9.74	10.38
Inyanga—				
St. Trias' Hill ...	10.05	9.87	21.70	12.35
Insiza—				
Roodeheuvel ...	5.89	4.17	10.77	8.89
Stoneham (Brae Valley) ...	4.27	3.78	8.61	n.s.
Makoni—				
Bude ...	6.86	8.89	17.07	n.s.
Craigendoran ...	5.29	8.25	15.04	12.38
Forest Hill ...	8.26	7.33	16.32	12.59
Gorubi Springs ...	...	...	...	11.85
Inyagura ...	...	...	...	n.s.
Kairidzi ...	8.23	9.72	18.60	n.s.
Mona ...	9.09	9.16	20.07	12.80
Monte Cassino ...	7.59	6.55	17.46	12.11
Ruati ...	6.97	8.16	15.73	n.s.
Rusape (N.C.) ...	7.61	11.35	21.18	n.s.
Springs ...	8.16	11.35	21.65	12.59
Whitgift ...	5.29	8.52	16.15	n.s.
Marandellas—				
Bonongwe ...	5.92	9.01	17.42	12.07
Delta ...	7.56	11.88	20.23	11.53
Elandslaagte ...	7.80	8.46	17.30	12.71
Lushington ...	5.51	...	...	n.s.
Macheke ...	6.60	7.00	15.58	11.75
Marandellas (N.C.) ...	6.94	...	...	12.30

RAINFALL—(*Continued*).

STATION.	1929. Nov.	1929. Dec.	Total to end of period.	Normal rainfall to end of period.
ZONE E.—(Continued)				
Marandellas (Continued)—				
Marandellas Estate ...	7.62	...	...	10.43
Nelson ...	8.25	11.85	20.41	11.46
Wedza Reserve ...	5.98	11.40	17.48	n.s.
Wenimbi ...	4.64	...	...	11.70
Melsetter—				
Brackenbury ...	7.38	11.64	19.23	14.77
New Year's Gift ...	5.74	5.61	12.44	n.s.
Sabi Tanganda Estate ...	3.51	4.65	8.50	n.s.
Ndanga—				
Bangala Ranch ...	2.85	4.61	8.46	n.s.
Doornfontein ...	6.84	7.04	15 27	9.10
Marah Ranch ...	3.37	8.50	13.07	10.60
Triangle Ranch ...	3.67	2 46	7.51	4.99
Zaka ...	6.40	4.75	11.95	n.s.
Selukwe—				
Aberfoyle Ranch ...	4.69	6.46	12.17	9.18
Hillingdon ...	4.91	5.77	11.53	11.28
Impali Source ...	3.79	6.23	10.66	9.35
Rio ...	5.91	6.17	12.61	9.98
Safago ...	6.83	7.27	14.54	11.43
Selukwe ...	6.74	10.68	19.50	11.25
Umtali—				
Argyll ...	3.87	6.38	12.77	11.30
Embeza ...	9.86	10.81	23.17	n.s.
Fairview ...	6.87	6.77	14.70	10.66
Fern Valley ...	6.33	...	...	9.88
Jerain ...	5.52	7.99	13.71	9.44
Mountain Home ...	7.26	10.20	19.96	n.s.
Mutambara Mission ...	5.49	5.88	11.90	10.13
Odzani Power Station ...	5.34	9.17	15.50	11.27
Park Farm ...	4.63	8.08	14.24	8.74
Premier Estate ...	6.36	7.80	16.32	10.12
Sarum ...	5.07	5.70	11 42	8.79
Sheba ...	9.96	15.28	29.14	n.s.
Stapleford ...	9.68	11.23	23.08	18.29
St. Augustine's Mission ...	6.45	...	...	11.00
Transsau Estate ...	2.85	6.27	11.72	8.92
Umtali Gaol ...	7.40	7.59	16.27	9.66
Victoria—				
Brucehame ...	5.39	...	...	9.26
Cambria ...	3.64	6.43	10.36	8.18
Cheveden ...	7.44	5.83	15.04	8.01
Clipsham ...	4.56	8.05	12.97	9.63
Gokomere ...	4.57	6.05	11.60	9.86
Kimberley Ranch ...	4.71	8.08	13.90	n.s.
Mashaba ...	5.73	6 01	12.21	9.14
Miltonia ...	4.03	5.97	10.11	n.s.
Riverdene North ...	6.13	5.22	12.04	8.78
Salemore ...	9.75	7.25	13.31	11.04

RAINFALL—(*Continued*).

STATION.	1929.		Total to end of period.	Normal rainfall to end of period.
	Nov.	Dec.		
ZONE E.—(Continued)				
Victoria (Continued)—				
Silver Oaks ...	4.88	7.24	12.60	9.87
Stanmore ...	5.36	...	5.86	9.13
Victoria ...	4.29	6.89	11.59	9.26
Zimbabwe ...	4.89	7.99	13.60	7.86
ZONE F.:				
Melsetter—				
Chikore ...	6.03	6.05	15.36	11.72
Chipinga ...	8.14	4.27	15.24	13.40
Lettie Swan ...	4.37	4.05	11.47	n.s.
Melsetter ...	4.32	4.14	11.96	13.72
Mount Selinda ...	6.60	...	...	15.71
Vermont ...	6.63	7.28	14.67	17.51
Umtali—				
Cloudlands ...	5.76	8.12	17.19	n.s.

Salisbury Experiment Station

FOR SALE.

KUDZU VINE CROWNS.

A limited quantity of kudzu vine crowns will be available for sale during January at the following rates:—

Large crowns ... ... 6d. each.
Small crowns ... ... 3d. each.

Prices are carriage free to any station or siding in Southern Rhodesia.

Purchasers are recommended not to plant small crowns, except on land which can be irrigated. Orders with remittances should be addressed to the Chief Agriculturist, Department of Agriculture, Salisbury.

Export of Cattle from Southern Rhodesia, 1929.

Month	Union		England.	Congo		N. Rhodesia	Portuguese East Africa.			Total
	Slaughter		Slaughter							
	Johannesburg	I.C.S. for overseas	On hoof	Slaughter	Breeding	Breeding	Slaughter	Trek	Breeding	
January ...	66	...	...	2,222	272	12	...	...	...	2,572
February ...	84	...	...	656	...	...	12	...	...	752
March ...	12	1,353	...	1,845	1,803	19	24	...	...	5,056
April ...	242	1,842	75	2,933	1,131	...	38	...	22	6,283
May ...	224	4,318	620	1,508	2,966	17	24	...	...	9,677
June ...	538	6,322	...	2,989	936	34	48	...	...	10,867
July ...	799	6,417	...	1,417	85	14	...	...	...	8,732
August ...	1,358	6,457	...	2,530	684	21	...	...	...	11,050
September ...	1,699	4,406	...	884	7	185	...	...	...	7,179
October ...	1,527	1,936	...	2,941	6	...	...	...	12	6,422
November ...	634	254	...	1,445	...	...	...	...	...	2,333
December ...	31	...	...	2,586	69	6	...	...	...	2,692
	7,214	33,305	695	23,956	7,959	306	146	...	34	73,615

Dates of Meetings of Farmers' Associations, Southern Rhodesia.

Name of Association.	Place of Meeting.	Secretary.	Feb.	March.
			1930	1930
Ayrshire—Sipolilo	Various farms	G. H. Cautherley	...	8
Banket Junction	Banket Hotel	A. M. Hutchinson	7	7
Beatrice District	Farmers' Hall, Beatrice	W. Krienke	27	27
Bindura	Bindura Farmers' Hall	W. E. Fricker	14	14
Bromley	Farmers' Hall, Bromley Siding	E. Taylor	5	5
Bubi	Queen's Mine	W. H. Perham	21	21
Bulawayo Landowners' and Farmers' Association	Library Buildings, Bulawayo	T. B. Hepburn	4	4
Chakari	Various farms	Lady Codrington	19	19
Daisyfield	Daisyfield (Feb.), Somabula (March)	L. E. Edwards	15	8
Darwendale—Trelawney	Various farms	Charles H. Tanner	26	26
Eastern Districts	Farmers' Hall, Chidza	W. E. Richards	8	8
Enkeldoorn	Enkeldoorn	C. N. Ludlowe	4	4
Enterprise	Farmers' Hall	W. Stobart	4	4
Essexvale	Essexvale	Col. D. Judson	16	16
Felixburg—Gutu	... ...	E. C. Fleetwood	...	...
Figtree Branch, R.L. and F.A.	Figtree Hotel	The Secretary	4	4
Gadzema	Gadzema Hotel	H. G. M. Liddell	14	14
Gatooma	Speck's Hotel	Col. J. A. Smith	15	15
Gatooma (Golden Valley Branch)	Golden Valley Hotel	C. K. James	8	8
Gazaland (South Melsetter)	Farmers' Hall, Chipinga	J. Ward	15	15
Greystone	Guarrie Farm	P. J. van der Walt	...	8
Gwanda	Lowenthal's Building, Gwanda	N. J. B. Nilson	15	15
Hartley	Hartley Hotel	Mrs. F. C. Watson	8	8
Headlands	Headlands	J. A. Eve	...	...
Hunter's Road	Hunter's Road	R. W. Twilley	22	29
Insiza South	Farm Lancaster	J. Campbell	...	...
Inyazura	Inyazura	W. P. Frudd	7	...
Lalapansi	Lalapansi	B. J. Ingle	8	8
Lomagundi	Sinoia	F. W. Robertson	...	...
Lomagundi West	Various farms	A. A. Bisset	9	9
Macheke	Farmers' Hall, Macheke	R. O. Jackson	...	...

Macheke Valley (Headlands) Farmers' and Tobacco Growers' Association	Various Farms	T. R. Colam	1	1
Makwiro	Makwiro	W. L. Parsons	21	21
Marandellas	Marandellas Farmers' Hall	E. Cruikshank	7	7
Marandellas, Southern	Various farms	B. V. Cherry	5	5
Mashonaland	Mashonaland Farmers' Hall, Salisbury	P. Wilson	14	14
Matobo South	Farmers' Hall, Malundi Farm	A. G. Allan	15	15
Matopo Branch, R.L. and F.A.	Farmers' Hall, Malundi	W. Mirtle	15	15
Mazoe (Concession)	Various farms	Douglas Southey	14	14
Mazoe (Glendale)	Farmers' Hall, Glendale	James S. Brown	12	12
Melsetter	Court House, Melsetter	J. C. Kruger	13	13
Midlands Farmers and Stockowners	Royal Hotel, Gwelo	T. R. van Rooyen	12	12
Ngezi-Umniati	Harvieston, Enkeldoorn	Miss Harvie	22	29
North Umniati	———	J. F. Eagar	Not	received
Norton and Lydiate District	Norton	R. D. Palmer	7	7
Nyamandhlovu	Nyamandhlovu	R. D. McLean	...	...
Odzi District Farmers	Odzi Hotel	M. Goldberg	1	1
Poorte Valley	Various places	A. D. Wilson	15	15
Que Que	Offices of the Que Que Sanitary Board	A. A. Ackerman	15	15
Rusape Farmers' Association	Rusape	R. Munch	1	1
Salisbury South	Various farms	P. Linton	26	26
Selukwe	The Hotel, Selukwe	W. T. Simpson	...	...
Shamva	Shamva Court House	J. R. Trevor	21	21
Two Rivers Farming Association	Various farms	W. L. Parsons	15	15
Umboe (Branch of Lomagundi F.A.)	Various farms	G. T. Gover	8	8
Umvukwe Farmers' and Tobacco Growers' Association	Various ranches	———	8	8
Umtali	Drill Hall, Umtali	A. Howat	6	6
Umvuma and District	Umvuma	S. T. Montgomery	Not	received
Victoria	Victoria	G. E. Lamb	1	1
Wankie District	———	F. H. Going	Not	received
West Umvukwe Farmers' Association	Various farms	G. H. Gordon	1	1
Western	Plumtree Hotel	The Secretary	8	8
Willoughbys	Willoughbys	A. E. Roberts	Not	received

Rhodesian Milk Records.

Official Milk Records.

Name of cow.	Breed.	Milk in lbs. to date.	Butter fat in lbs. to date.	No. of days.	Name and address of owner.
Morgenzon Ermine	Friesland	2,885.80	84.13	142	W. R. Blackwell, Norton
Morgenzon Nonaber	do	2,427.90	86.56	130	do do
Morgenzon Kleinhans	do	3,188.60	96.15	136	do do
Boontjes of Kaalplaats	do	2,627.50	85.76	120	A. T. Holland, Chatsworth
Shenfield Bulema	do	1,295.50	47.85	60	do do
Princess Park Primrose	do	2,395.50	70.26	90	G. A. Lyons, Bulawayo
De Grendel Nancy	do	3,166.00	97.64	60	do do
Planchette of Tolosa	do	1,919.80	57.76	60	F. B. Morrisby, Gwelo
Riverview Mary	do	974.90	30.80	30	do do
Maldon Broadhooks	Shorthorn	955.00	35.79	60	Roberts & Letts, Heany Junction
Middleton's Zoe	Friesland	4,556.00	133.16	120	R. R. Sharp, Redbank
Whinburn Primrose	do	4,014.50	165.06	150	do do
Middleton's Pamphylia	do	5,254.50	162.49	180	do do
Whinburn Spottie	do	4,790.00	163.21	180	do do
Whinburn Annette	do	2,217.50	66.18	90	do do
Whinburn Zephyr	do	1,415.00	38.20	60	do do
Whinburn Pansy	do	1,641.00	48.88	60	do do
Brightwell Rain	Red Poll	3,714 50	112.98	120	Govt. Farm, Matopos
Drinkstone Missie	do	1,903.70	63.72	60	do do
Threave Flowergirl	Ayrshire	971.00	43.11	30	do do
De Grendel Selma	Friesland	6,315.00	164.92	180	Govt. Farm, Gwebi
Melrose Corrie	do	5,482.00	137.85	120	do do
Madge of Batavia	do	2,793.00	84.08	90	do do
Gwebi Beryl	do	1,655.00	53.10	90	do do
De Grendel Bessie Burger	do	2,405.00	74 85	60	do do

RHODESIAN MILK RECORDS (continued).

Semi-official Milk Records.

Name of cow.	Breed.	Milk in lbs. to date.	Butter fat in lbs. to date.	No. of days.	Name and address of owner.
Primrose ...	Grade Friesland	2,268.30	74.94	108	W. R. Blackwell, Norton
Waterbloem ...	do	2,112.10	71.73	110	do do
Kleinbloem ...	do	2,493.80	78.57	99	do do
Mooibloem ...	do	1,271.70	41.90	60	do do
Dapple ...	do	2,483.00	83.68	90	A. T. Holland, Chatsworth
Lily	do	1,086.50	30.07	60	do do
Jessie ...	do	646.00	19.63	30	do do
Starlight ...	do	500.00	17.75	30	do do
Diamond ...	do	778.00	18.67	30	do do
Mumsy ...	do	568.00	16 75	30	do do
Patricia ...	Grade Shorthorn	2,270.50	82.42	90	D. Jarvis, Gwelo
Barbara I. ...	Grade Friesland	4,464.20	131.21	120	F. B. Morrisby, Gwelo
Freezia ...	do	5,575.30	178.15	180	do do
Youth ...	do	3,179.20	77.90	150	do do
Daffodil ...	do	3,242.00	96.30	120	do do
Bertha ...	do	1,022.00	43.04	42	C. J. Orford, Rusape
Ginger ...	do	2,394.30	53.16	105	do do
Rosemary ...	do	684.60	27.38	35	do do
Redbank No. 165	Grade Shorthorn	2,757.00	91.70	90	Roberts & Letts, Heany
Bochen Sheila No. 127	do	2,059.00	63.36	90	do do
Lyandu ...	do	626.00	22.41	30	do do
Whinburn Linnet	Grade Friesland	6,621.50	179.78	150	R. R. Sharp, Redbank
Whinburn Buttercup	do	5,415.50	174.36	150	do do
Whinburn Butterfly	do	4,175.00	117.08	150	do do
Whinburn Sidi	do	3,816.00	108.16	150	do do
Whinburn Blackbird	do	5,487.50	171.91	180	do do
Wren ...	do	2,232.00	61.57	60	do do
Whinburn Plush	do	948.00	21.61	30	do do
Victoria ...	S. Devon	1,829.00	69.66	100	M. S. Smith, Gwelo
Jane	Grade Shorthorn	1,432.00	59.26	100	do do
Grace ...	Grade Friesland	1,242.00	43.81	60	do do
Flora	do	1,099.50	36.12	60	do do
Ugly	do	589.50	29.47	30	do do
Wendy ...	Grade Ayrshire	686.50	29.17	30	do do
Migit... ...	Grade Kerry	715.00	22.59	30	do do
Doreen ...	Grade Friesland	493.50	15.29	30	do do
Daisy... ...	do	612.50	22.78	35	A. F. Valentine, Umtali
Midget ...	do	343.00	14.57	21	do do
Gwebi Sunshine	do	3,340.00	107.53	150	Govt. Farm, Gwebi
Gwebi Aglie ...	do	2,579.50	88.86	150	do do

RHODESIAN MILK RECORDS (continued).

Semi-official Milk Records (continued).

Name of cow.	Breed.	Milk in lbs. to date.	Butter fat in lbs. to date.	No. of days.	Name and address of owner.
Gwebi Janie ...	Grade Friesland	2,404.50	89.10	90	Govt. Farm, Gwebi
Gwebi Polly ...	do	1,204.50	45.96	90	do do
Gwebi Mabel ...	do	2,389.50	75.72	90	do do
Elsie	do	2,401.00	71.32	60	do do
Gwebi Fairy ...	do	1,237.50	37.79	60	do do
Gwebi Allie ...	do	435.00	17.09	30	do do

Unofficial Milk Records.

Name of cow.	Breed.	Milk in lbs. to date.	Butter fat in lbs. to date.	No. of days.	Name and address of owner.
Ogden Hall Alberta	Friesland	9,339.10	...	318	W. R. Blackwell, Norton
Dunoran Pearl	do	9,700.20	...	288	do do
Edwinton 1 ...	do	3,000.65	...	120	Harley & Son, Syringa
Edwinton 2 ...	do	3,062.42	...	120	do do
Edwinton 9 ...	do	2,159.80	...	90	do do
Edwinton 6 ...	do	1,808.05	...	60	do do
Edwinton 10 ...	do	1,051.75	...	60	do do
Edwinton 7 ...	do	526.00	...	30	do do
Edwinton 8 ...	do	718.00	...	30	do do
Julia	Grade Friesland	3,078.25	...	120	C. E. Strickland, Shamva
Kate	Grade Shorthorn	2,697.50	...	120	do do
Freesia ...	Grade Friesland	1,570.00	...	90	do do
Snowdrop ...	Grade Shorthorn	717.75	...	30	do do
Melrose Hetta...	Friesland	13,233.50	435.19	300	Govt Farm, Gwebi
Mimosa Stienser	do	6,048.50	199 47	270	do do
De Grendel Froukje	do	7,261.50	194.11	210	do do
Mimosa Pel Fancy	do	6,969.00	216.89	210	do do
Mimosa Pel Fancy II.	do	6,694.00	260.09	240	do do
De Grendel de Hoop	do	7,777.50	244.79	240	do do
Mimosa Clara II.	do	6,799.50	218.51	210	do do
Waterbloem ...	Grade Friesland	14,620 75	433.42	371	do do
Isa ...	do	12,409.50	398.94	370	do do
Fanny ...	do	11,285.00	380.52	300	do do
Gwebi Princess	do	7 383.00	237.52	300	do do
Kleinbloem ...	do	7,907.00	256.45	300	do do
Gwebi Klein-bloem	do	7,467.50	223.17	270	do do
Hannah ...	do	10,909.00	312.41	240	do do
Gwebi Lucy ...	do	7,722.00	226.51	240	do do
Black Bess ...	do	3,489.50	131.78	180	do do
Royal Tilford ...	do	4,683.50	145.85	180	do do

Farming Calendar.

February.

BEE-KEEPING.

In most parts of the two Rhodesias this month is one of fair activity for all bees, there being as a rule quite enough nectar, pollen, etc., available for all ordinary purposes of rearing, building cells, etc., and working generally for the due upkeep of the colony for the present as well as for the coming winter. Whether there will be any surplus honey for them to store will depend upon what crops the farmer may have on hand at this time, as the usual flora of the land will not supply it until the regular second flow of the year is due, which should be in March to April, according to the season.

Watch carefully for robbers, though, with well attended hives and due care in handling, there should be little to fear in this direction; strong, well filled hives can always repel robbers, which are only successful with weak colonies, and these no apiarist should ever have under his care. Mark well last month's advice, i.e., to have everything in readiness for dealing with unexpected new swarms that may be required as they may come, for nothing is more disconcerting or annoying than to be unready when the time arrives. This applies especially to any swarms that may come from the apiary, for a few days only of neglect of such a hive may easily lead to the moth taking early possession of the combs, and in practically a few hours destroy fully drawn-out combs that would otherwise be of much value for after working upon. Such combs, as they are available, should at once be packed away in an air- and moth-tight box or tin for after usage.

CITRUS FRUITS.

Newly-planted citrus trees should be kept free of weed growth likely to exclude necessary air and light for their normal and healthy development. Citrus trees planted in February seldom give satisfactory results; late planted trees do not mature their new growths before winter, and they are more susceptible to winter injury or the ravages of disease or insect pests. The early planted cover crops will be fit to plough under by the end of the month. Do not delay this operation for fear of the rains ending abruptly. If this occurs, great difficulties will be experienced when attempting to plough in the green crops. Keep all young shelter belt trees free of weed growth, and loosen the soil round their stems fairly frequently to eliminate possible ant injury. This is one of the best months for budding citrus trees, either in the nursery or grove—trees that are to be top worked to profitable varieties. Late out-of-season fruit that may have set during December-January should be stripped from the trees. This fruit is valueless for export, and if allowed to mature, will affect the main crop setting of fruit.

DECIDUOUS FRUITS.

When sufficiently mature, plough under cover crops. This should be possible towards the end of the month.

Summer pruning should be completed early in the month; little or no advantage will be derived from trees treated when the new wood reaches maturity.

Do not allow fruit to become over-ripe, then expect remunerative prices for it. If it is harvested at the correct stage, then well graded and neatly packed, good prices may be expected for the surplus fruit sold.

This is a good month for budding deciduous fruit trees.

CROPS.

Cultivate, and keep on cultivating as weather permits, to destroy weeds. Continue to look out for stalk borer, and, if infection is discovered, deal with infested plants as advised in January notes. Watch witch weed and continue cultivating and hand pulling it. Plough under witch weed, smother and trap crops. Where practised, maize can be under-planted with sweet potato vines after the last cultivation for the following season's requirements. Potatoes and ground nuts will probably need to be ridged again. Catch crops of quick maturing beans, such as tepary bean, also buckwheat, can still be sown. Keep down all noxious weeds. This work can be undertaken on wet days. Make veld grass hay whenever a few days of fine weather permit. Early mowings provide the best hay. Seed beds of onions for early winter planting can be sown towards the end of the month. Keep potatoes in a cool shed, well ventilated. Pick over any potatoes in storage and remove bad ones. Continue to make as much farm manure as possible. Begin to ride manure and place in heaps handy to the lands to be manured.

DAIRYING.

This is normally the flush season as far as dairy produce is concerned; dairy cattle are usually in good condition and cows of average capacity should be able to subsist and maintain a full flow of milk on veld grazing alone. Calves may be given a few hours' exercise on bright, sunny days; young stock, however, should not be allowed to run and graze with the herd, and are best kept in a cool, airy pen opening on to a small shady paddock, where they can obtain a little exercise.

A good quality of sweet hay and water should always be available for young calves.

Cream deteriorates very rapidly under the conditions which obtain at this time of the year, so that every precaution should be taken to keep the cream as cool as possible pending despatch to the creamery. As there is a greater strain than usual on the separator during the flush months, frequent oiling is necessary, and care should be taken that the machine is mounted on a level foundation. The separator and all other dairy utensils must be cleaned immediately after use. First rinse the utensils with cool or lukewarm water, then wash thoroughly with boiling hot water, washing soda and a scrubbing brush; scald finally with boiling water.

The cheese in the storeroom is apt to develop mould during wet weather. If the cheese is well made and pressed and has a smooth rind, this mould is merely superficial and will not penetrate into the body of the cheese. Rubbing the cheese with a cloth moistened with a weak solution of formalin or permanganate of potash usually checks the development of mould. During these months care must be taken not to use over-acid milk for cheesemaking, and great care should also be taken of the starter. If this latter shows any signs of gasiness or develops any disagreeable flavour or odour it should be discarded and replaced by a fresh, clean starter. The cheese storeroom must be kept dark and flies excluded.

ENTOMOLOGICAL.

Maize.—The first brood of the stalk borer matures this month, and the young of the second brood may be found amongst the younger leaves. Weeds should be kept down.

Tobacco.—Stem borer, leaf miner and budworms are the chief pests likely to be troublesome. Plants in the field found infested with the first

two insects should be heavily pruned or destroyed. The budworm caterpillars can usually be hand picked during the process of topping. (See "Rhodesia Agricultural Journal," December, 1927.)

Potato.—Ladybirds and tuber moth may call for attention. The latter, when very bad, sometimes causes considerable wilting of the crop besides attacking tubers. The ladybirds may be destroyed by spraying with arsenate of lead 1 lb. to 16 gallons of water.

Cabbage Family.—All members of the family are liable to be attacked by the sawfly and webworm. The sawfly may be effectively controlled by dusting during a dry spell with Paris green and slaked lime (1 lb. Paris green and 20 lbs. slaked lime).

Melon Family.—The most important pest is the melon fly, which "stings" the fruit of all species of gourds. Destroy all badly "stung" fruit and spray remainder thoroughly with arsenate of lead (2 ozs. in 4 gallons of water) to which $2\frac{1}{2}$ lbs. of cheap sugar has been added.

Deciduous Fruit.—Apples, pears and late peaches suffer chiefly from fruit moths, which puncture the fruit. No remedy available except covering the trees with netting.

Fig.—The fruit is liable to the attack of the fig weevil. All infested fruit and all wild fruit should be collected and destroyed. The borer in the stem may be killed by inserting a little carbon bisulphide into the burrow and sealing it up.

Poison Baiting.—Poison baiting against surface beetles, cutworms, etc.: No really effective bait has yet been discovered for cutworms, but the following poisoned bait is recommended for surface beetles, etc.: Paris green 1 lb., 180 lbs. maize meal. Mix thoroughly in dry state and add water until the material is of the consistency of a dough. Roll into small balls and place under shade. Spread in the evening.

FLOWER GARDEN.

Sow carnations, phlox, pansy, verbena, gilias, larkspur, dianthus and pentstemon. The flower garden should be now looking its best, nearly all plants being in bloom. Old and dead flowers should be constantly removed, except when the seed is required. Seeding of the plants shortens their flowering period. All runners and climbers should have constant attention, and be tied up and trained, otherwise they will be damaged by the wind. Dahlias, chrysanthemums and carnations will require staking, as they become top heavy when in flower. Make the first sowing of winter-flowering sweet peas.

VEGETABLE GARDEN.

Sow now—Beans, beet, cabbage, cauliflower, lettuce, peas, onions, carrots, parsnips, turnips, endive, kohl rabi, rhubarb and all herbs.

FORESTRY.

Tree planting operations should be carried out on dull, showery days or late in the afternoons. Take care in setting out the plants, avoid bending the roots, and do not plant deeper than the plants were in the seed beds or trays. Steps should be taken to prepare seed beds for the slower growing species, i.e., pines, cypresses and callitris, and seed of these species should be sown for the following season's planting.

GENERAL.

This is a busy time for the farmer. Weeds will be very much in evidence and difficulty will be experienced in keeping them under. Stock will have fully recovered their condition, but ticks will be troublesome. The dipping tanks must be fully utilised now.

POULTRY.

Cockerels for future breeding should now have been selected, and those not good enough sold for killing. It pays far better to get rid of all of

the latter, even if only at 1s. or 1s. 3d. per lb., than to keep them on, eating their heads off, in the hope of getting a better price. Those good enough for breeding, and they must be good, should be kept till about June; there is a demand for such up to this month. Any surplus at this time should be eaten or sold for what they will fetch. Of those selected for breeding purposes, the owner should keep the best one or two for his own use, with another as a reserve. No poultry keeper should sell his best stock, no matter how high a price is offered for it.

By the end of this month the birds selected for breeding should be mated up. If it is possible, the birds selected for breeding should be given a run on free range for three weeks or so before being put into the breeding pen and fed sparingly; better fertility and better chicks will be the result. If it is possible to run the birds selected for breeding away from the others during the whole of the breeding season, all the better. Any hens that become broody should be kept broody by setting a few china eggs under them until such time as eggs from the breeders come in. Broody hens at this time and for the next five months are valuable.

During the rainy season the scratching litter must be kept dry; if it gets wet it is useless.

Duck hatching can be continued all the year round; the main points are that the young ducks must be kept out of the sun and sleep on dry grass. Nothing is more fatal to ducklings than sun, and dampness at night; and the latter applies, too, to the adults. Unless a dry shed, with a dry, soft layer of chaff or sand, etc., covering the floor of it, is available, it is not wise to hatch turkeys till after the wet season is finished, for it will be labour, food and eggs wasted. If the young turkeys get wet they are almost certain to die. This and the feeding on wet mashes instead of dry food, chopped onions and thick milk are the chief reasons for non-success in the breeding of turkeys.

STOCK.

Cattle.—Grass should now be at its best, and no anxiety need be felt about feed. In the case of milking cows which have been fed during the earlier rainy months, a little mealie meal, cotton cake or ground nut cake may still be given at milking, if only to bring them quietly to their places. The importance of a clean, light, airy and well-drained shelter for calves cannot be over-estimated. Calves up to three or four months old do not require a great deal of exercise, and on wet days are better left in a dry shed with a little sweet hay. A few hours' exercise on bright days in short grass is all they need. Vigilance in keeping down ticks must not be relaxed. These remarks apply specially to milking herds and to cattle that are kraaled. Cattle running at large need little attention beyond dipping, and if the calves are not desired from November to March, the bulls must now be taken out of the herd. Weather permitting, no opportunity should be lost of getting in a supply of good sweet hay before the grass is too old. A good lick should always be provided.

Sheep.—Vleis and low-lying ground must be avoided. Sheds should be airy, dry and clean. If grass seeds are troublesome to woolled sheep, an area should be mown for them, or when rain begins to slacken, they may be shorn. If wire worm is troublesome, dose regularly each month with wireworm remedy.

TOBACCO.

The early tobacco should now be ready for curing. Care should be taken to select only thoroughly ripe leaf for filling the barns, so that the cured product will be uniform. Topping, priming and suckering should be given attention. Selected seed plants should be carefully watched. New land intended for tobacco next year should be ploughed this month, so that all organic matter turned under may be converted into humus before planting time next season.

WEATHER.

This is often the wettest month of the year, with marked differences of from 10 inches to 15 inches on the eastern mountain ranges, $7\frac{1}{2}$ inches over Mashonaland, 4 inches to 6 inches in Matabeleland, and least, but still some, rains in the Limpopo Valley. The rains may be expected to decrease in intensity after the middle of the month if the season is normal.

March.

BEE-KEEPING.

As the latter end of this month should herald the approach of the second and last real honey flow of the season, see that enough extra supers are ready for placing on hives as required, watching also that the fully drawn out combs of shallow frames that are on hand to fill them with are kept free from the wax moth; further, examine all supers that are already on the hives for this serious defect, though strong colonies will as a rule keep the combs free from this pest. March being usually a hot month, look well to the entrance; enlarge when and where necessary, and have ventilating lids on the tops of each hive. Extra ventilation can be provided for when required by placing small metal or wooden wedges underneath the top super, but not to be open enough to let out or in a single bee. Where quilts are noticed to have been eaten or more or less destroyed during the summer months, now is the time to make fresh ones so as to be ready for the closing down and the making snug of each hive when winter approaches; old flour bags or old deck chair canvas make capital quilts. Bees during this month will consume a quantity of water; see that some is always kept in the apiary in floating cork chips. This will save much labour and flight for them, as well as prolong their period of work and usefulness. As stated in last month's notes, flying swarms may be expected now any day, so prepare for their capture if required by having all details and items ready for immediate use. It is as well, however, at this date of the season to do without such swarms, unless the owner is prepared to feed them well during the winter months. March or April swarms, unless they are hived under conditions of providing all the frames, of fully drawn out old combs, do not as a rule have either the time or materials to provide for a strong colony before the winter sets in, and must perforce remain a weak one during that period. The axiom of every bee-keeper should be to let his colonies go into winter quarters brimming over with bees, not only to provide against the mortality that is bound to occur then, but to have a full hive to start the next season with.

CITRUS FRUITS.

Two thorough sprayings about this season, when the rains are usually practically over, at an interval of about two weeks, will often obviate the necessity for further work against scale insects until the beginning of the next wet season. If not already done, orchards should be ploughed and cross-ploughed and worked up into a really good surface, so that the cultivators can be kept going, say, every two weeks until it is necessary to irrigate, after which cultivation should be continued. If March prove a dry month, orange trees holding up a crop of fruit will probably require irrigation, but under normal weather conditions it should not be necessary. The same remarks apply as last month with regard to fruit moths. About the end of this month fall budding can be taken in hand, that is the insertion of buds that are intended to remain dormant until spring. This applies to higher altitudes, but in low country, where the growing season is extended, dormant budding should not be done until latter end of April.

CROPS.

Watch oats for rust, and, if badly infested, cut crop for hay as soon as weather permits. Ridge late potatoes, and if weather is dry prevent ridges from cracking, to check tuber moth infestation. Finish ploughing under all green manure crops while the ground is still moist enough to promote rapid decomposition. Late in the month begin to cut silage crops and ensile. Cut out barren maize plants and feed to stock or ensile. Cut Sudan grass for hay to permit of final late growth for autumn grazing. Reap any crops that are ready, and plough the stubbles **at once.** Lift ground nuts that are sufficiently matured. Watch for ground nuts making second growth; reap, and when sufficiently dry, place in cocks with nuts inwards and cover the top securely. Sow onion seed beds for winter crop. Watch the weather for hay-making and take advantage of fine spells. Towards the end of the month hay-making should normally be in full swing. Continue to plough all lands in succession immediately the crops are reaped from them. Vleis and irrigable lands should now be ready, or in process of being prepared, for winter crops. Early sowings of Algerian oats, barley or rye for green forage can be made. Allow any potatoes lifted to dry before storing them, but do not leave too long in the sun. Destroy witch weed and other noxious weeds. Continue to make all the kraal manure possible by throwing grass and litter into kraals, yards, etc. Begin to select in the field maize plants for seed purposes, and mark them with slips of coloured cloth. Press on with the breaking up of any virgin land which may have been stumped or cleared earlier in the year. Place orders for grain bags without delay. Early in the month silage pits should be cleaned out or, where necessary, new pits dug.

DAIRYING.

This is usually the most favourable month of the year for dairy operations. Cooler nights are now in evidence, and there is usually little difficulty in maintaining a low temperature in the dairy and cheese-room. If elementary precautions are taken, all cream should be first grade, and first-class cheese should be made, as a gassy condition of the milk is rare. Dairy cows, unless they are very high producers, can go without extra rations, because the grass is now in seed and grazing is ample. The cheese storeroom is generally full of cheese, and care should be taken to turn the cheese regularly. The windows and doors should be opened at night and closed in the daytime. A little mould on the cheese will not affect its quality, but if the mould is excessive the cheese should be rubbed daily.

Calves which are under four months old should be kept in and allowed to nibble at well-got hay; at the same time a little dry mealie meal and monkey nut cake will do them good and teach them to eat concentrates. An ample supply of clean water should be provided in the calf run.

ENTOMOLOGICAL.

Maize.—The stalk borers of the second brood may now be found in the stalks, but nothing can be done at this stage. Caterpillars sometimes attack the crop as a sequel to cultivation after grass weeds have made too much growth. The caterpillars attack the crop on account of their more natural food being suddenly destroyed. Prevention and not cure is indicated.

Tobacco.—The crop will by this time mostly have outgrown insect injury, but leaf miners and budworms may be in evidence. The latter are usually destroyed by hand when topping. Any plants affected with stem borer should be removed and destroyed.

Potato.—If ladybird beetles or caterpillars are injurious, spray with arsenate of lead (powder) 1 lb. to 30 gallons of water. Careful hilling should be attended to with the object of preventing and checking tuber moth attack.

Vegetable Garden.—If sawfly attacks plants of the cabbage family dust with Paris green 1 lb., fine sifted slaked lime 20 lbs. Against cabbage louse (aphis) wash plants frequently with a strong spray of water. Destroy blister beetles by hand. Plants of the melon family may be baited regularly with arsenate of lead (powder) $1\frac{1}{2}$ ozs., treacle $\frac{1}{2}$ gallon (or cheapest sugar $2\frac{1}{2}$ lbs.), water 4 gallons, to keep down fruit flies. For leaf-eating caterpillars and beetles, etc., spray with arsenate of lead (powder) 1 lb. in 30 gallons of water on foliage which will retain water. Cabbages are best dusted.

Citrus Trees.—Collect and destroy infested fruit to keep down citrus codling. Fruit-piercing moths sometimes attack the fruit during the month, especially navels. They work at night and can only be dealt with at present by hand destruction. The trees should be watched for development of aphis and soft brown scale on the young growth and prompt measures taken. Resin wash at two-thirds standard strength is suitable.

Mosquitoes, House Flies, etc., may be very prevalent during March. Destroy breeding places. Poison or trap adult flies. Attend to screening of residence.

FLOWER GARDEN.

Flower seedlings for winter blooming should now be coming on, and should be planted out during showery or cloudy weather. Cuttings of carnations may now be made, and should be taken from selected plants which have borne the choicest blooms. The cuttings should be dibbled in half paraffin tins containing three parts sand to one of loam, and kept in a moist condition in a shady position sheltered from the winds. Make main sowing of winter-flowering sweet peas in a well-prepared and rich soil.

VEGETABLE GARDEN.

The sowing calendar is the same as that recommended for last month. Plant out from seed beds cabbage and cauliflower; care should be taken during this month, as the end of the rainy season approaches, to dig with a fork all the ground in the garden. The heavy rains settle this down hard, and as soon as the dry weather begins the soil cracks and lets out all the sub-soil moisture by evaporation. As soon as the rains cease entirely it is advisable to go over the ground and fine down with a rake, leaving some three or four inches of quite fine soil to act as an earth mulch.

FORESTRY.

Cultivation where necessary should be undertaken between the rows of trees planted out in previous months. If cultivation is carried out with the hoe, care should be taken not to pile earth round the base of the stems. New ground for next season's planting should be roughly broken up with the plough. Bulk plantings may be proceeded with during the month.

GENERAL.

At this time the condition of stock on the veld is usually good. It is well, however, to look ahead and make ready for the coming winter by the provision of winter feed in such forms as veld hay, silage, baled fodder from maize, manna, oats, teff, velvet beans, and the like, and by taking steps to ensure that water will be available for the stock in winter as near their grazing ground as may be.

POULTRY.

The breeding pens should have all been mated up by now, as the first chicks should be out by the beginning of April. Much more care should be used than is usually the case when selecting birds for breeding. Only the very best, i.e., the strong, healthy, vigorous ones from the best layers, should be chosen. A pamphlet on "Selection and Mating for Improvement" can be obtained on application to the Editor or the Poultry Experts. This deals fully with the subject. Always keep an eye on the male bird; many are apt to get thin and run down in health, due to their allowing

their mates to eat all the food. Such birds are better breeders than those that chase their mates away from the food. Every male that is being bred from should be given a good meal by himself each day, to ensure health and vigour. The incubator should be thoroughly overhauled, cleaned and disinfected before the eggs are put in.

STOCK.

Cattle.—The precautions recommended for February apply equally to March. Arrangements should be completed for storing as much silage as it is proposed to make, so that the crops reserved for this purpose may be harvested immediately they are ready.

Sheep.—The same precautions as for February should be taken, but as less rain may be expected, conditions will probably be more favourable. If late winter lambs are not desired, the rams should be removed from the flock.

TOBACCO.

All late plants should be topped low to hasten maturity. The bales of cured leaf should be examined to ascertain whether or not the tobacco has been baled in proper condition. Seed heads should receive continued care. Land ploughed during February should be disced and rolled to assist the decomposition of organic matter. Tobacco fields already cleared of plants should be immediately ploughed. Tobacco bulks should be examined and turned, if necessary.

WEATHER.

Rains may be looked for in considerable quantity, though less than in previous months, 5 inches in Mashonaland and 3 inches in Matabeleland being normal, with as usual more on the eastern frontier. No useful rain need be reckoned upon after the end of this month, except on the eastern border, but the rainy season tapers off in an irregular and often erratic manner and without certainty.

Applications for the Use of Water in Terms of the "Water Act, 1927."

In order to facilitate arranging the sittings of the Water Court in such a manner as will entail a minimum of cost to applicants, persons desirous of having applications to the Water Court considered in the current year are advised to lodge the same with the Water Registrar, Law Department, Salisbury, not later than the dates set out hereunder opposite the districts in which they respectively reside.

Districts.	Latest date for lodging applications.
Matabeleland and Victoria	15th April, 1930
Mazoe, Lomagundi, Salisbury, Hartley, Charter, Darwin, Mtoko, Mrewa, Marandellas, etc.	15th June, 1930
Eastern Districts	31st August, 1930

Departmental Bulletins.

The following Bulletins, consisting of reprints of articles which have appeared in this Journal, are available for distribution free of charge to applicants in Southern Rhodesia only. Outside Southern Rhodesia, 3d. per copy.

AGRICULTURE AND CROPS.

No. 174. Notes on Hop Growing, by H. G. Mundy, F.L.S.
No. 218. Useful Measurements for Maize, by J. A. T. Walters, B.A.
No. 225. Napier Fodder or Elephant Grass, by J. A. T. Walters, B.A.
No. 278. New Crops for Rhodesia, by J. A. T. Walters, B.A.
No. 362. The Cultivation of Rice, by H. G. Mundy, F.L.S.
No. 374. Fibre Crops, by J. A. T. Walters, B.A.
No. 403. Florida Beggar Weed, by H. G. Mundy, F.L.S.
No. 429. Propagation of Kudzu Vine, by H. C. Arnold.
No. 442. Swamp or Irrigation Rice, by K. V. Yoshi, Bombay.
No. 510. Check-row Planting of Maize, by H. G. Mundy, F.L.S.
No. 513. The Carob Bean in Rhodesia, by J. A. T. Walters, B.A.
No. 541. The Potato Crop under Irrigation, by G. R. Syfret.
No. 545. Artificial or Synthetic Farmyard Manure, by H. G. Mundy, Dip.Agric., F.L.S.
No. 550. Onion Growing under Irrigation, by C. Mainwaring.
No. 561. Wheat Growing in Rhodesia, by C. Mainwaring.
No. 568. The Treatment of Arable Land, by G. N. Blackshaw, O.B.E., B.Sc., F.I.C.
No. 581. Leguminous Crops for Stock and Soil Improvement in Southern Rhodesia, by C. Mainwaring, Agriculturist.
No. 590. Rye, by H. W. Hilliard, Junior Agriculturist.
No. 591. Maize Export Conference Proceedings.
No. 598. Drought-resistant and Early-maturing Crops for Areas of Late Rainfall, by C. Mainwaring.
No. 599. Rhodesian Soils and their Treatment, by E. V. Flack.
No. 601. Maize for Export, by S. D. Timson.
No. 603. The Production of Maize in Southern Rhodesia, by C. Mainwaring, Agriculturist.
No. 627. The Growing of Potatoes in Southern Rhodesia (Revised), by C. Mainwaring, Agriculturist.
No. 630. The Storage of Seed Potatoes, by H. C. Arnold.
No. 634. Barley, by P. V. Samuels.
No. 643. Noxious Weeds in Southern Rhodesia, by F. Eyles, Botanist.
No. 650. Coffee Culture in Southern Rhodesia, by G. W. Marshall, Horticulturist.
No. 651. Two Important Leguminous Crops: The Velvet Bean and Dolichos Bean, by C. Mainwaring, Agriculturist.
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No. 664. Some Common Ailments of Poultry, by A. Little, Poultry Expert.
No. 721. Poultry Keeping in Rhodesia: Pedigree Breeding, by H. G. Wheeldon, Assistant Poultry Expert.
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No. 740. Artificial Incubation, Brooding and Rearing of Chickens, by H. G. Wheeldon, Poultry Expert.
No. 761. Housing and Feeding of Adult Stock, by H. G. Wheeldon, Poultry Expert.
No. 770. Talks to Breeders: The Normal and Pullet Moult, by H. G. Wheeldon.

The following pamphlets can be obtained from the Poultry Expert upon application:—

Selecting Birds for Laying Tests, by A. Little, Poultry Expert.
Cold Weather: Treatment of Fowls in, by A. Little, Poultry Expert.
Tuberculosis, by A. Little, Poultry Expert.
Diseases of the Liver, by A. Little, Poultry Expert.
Prevention of Disease among Poultry, by A. Little, Poultry Expert.
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Chicken-pox (Warts), by A. Little, Poultry Expert.
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Autopsies (continued), by A. Little, Poultry Expert.
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Selecting Birds for Laying Tests (concluded), by A. Little, Poultry Expert.
The Normal and Pullet Moult, by H. G. Wheeldon, Assistant Poultry Expert.
Culling: A Seasonal Operation, by A. Little, Poultry Expert.
Despatching Birds to a Laying Test, by A. Little, Poultry Expert.
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METEOROLOGICAL.

No. 360. Notes on the Rainfall Season 1919 20 in Southern Rhodesia, by C. L. Robertson, B.Sc., A.M.I.C.E.

No. 436. The Possibility of Seasonal Forecasting and Prospects for Rainfall Season 1922-23, by C. L. Robertson, B.Sc., A.M.I.C.E.

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No. 712. The Time, and How to Find it, by N. P. Sellick, M.C., B.Sc. (Eng.).

MISCELLANEOUS.

No. 93. Formation of Agricultural Credit Associations in Rhodesia, by Loudon M. Douglas, F.R.S.E.

No. 248. A Preservative for Samples of Arsenical Dips for Analysis, by A. G. Holborow, F.I.C.

No. 274. Lecture on Malaria and Blackwater, by A. M. Fleming, C.M.G., M.B., C.M., F.R.C.S.E., D.P.H., Medical Director.

No. 479. Quinine Prophylaxis in Malaria, by A. M. Fleming, M.B., C.M., F.R.C.S.E., D.P.H.

No. 518. Locusts as Food for Stock, by Rupert W. Jack, F.E.S.

No. 549. Ochna Pulchra Berries, by A. W. Facer, B.A., A.I.C.

No. 554. Pisé-de-Terre, by P. B. Aird.

No. 569. Education of Children of Farmers in Southern Rhodesia, by R. McIntosh, M.A.

No. 574. Brick-making on the Farm, by A. C. Jennings, Assoc.M.Inst.C.E., A.M.I.E.E.

No. 588. Concrete on the Farm, by N. P. Sellick, M.C., B.Sc. (Eng.), Assistant Irrigation Engineer.

No. 652. Farm Homesteads, by R. H. Roberts, B.Sc. (Eng.).

No. 677. Road Motor Services.

No. 680. Preparation of Cotton for Sale, by H. C. Jefferys.

No. 686. The Land Bank, Its Functions and How it Operates, by S. Thornton.
No. 687. The Use of Explosives on the Farm, by P. H. Haviland, B.Sc. (Eng.)
No. 699. The Preservation of Farm Beacons, by L. M. McBean, Acting Surveyor General.
No. 702. Book-Keeping on the Farm, by T. J. Needham, Acting Accountant, Agricultural and Veterinary Departments.
No. 707. Wood-Charcoal in Southern Rhodesia, by T. L. Wilkinson, B.Sc., Assistant Forest Officer.
No. 733. Jam-making, by Miss D. Bosman, Home Economics Officer, Division of Agricultural Education and Extension, in "Farming in South Africa."
No. 764 How to Make Use of the Fencing Law
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All prices quoted are for *delivery free at any station or siding* in Southern Rhodesia. Before sending cheques, intending purchasers are advised to ascertain that the seeds, etc., required are still available. Cheques should be made payable to "Gwebi Farm." All orders and enquiries should be addressed to the Chief Agriculturist, Department of Agriculture, Salisbury, *not direct to the Gwebi Farm.*

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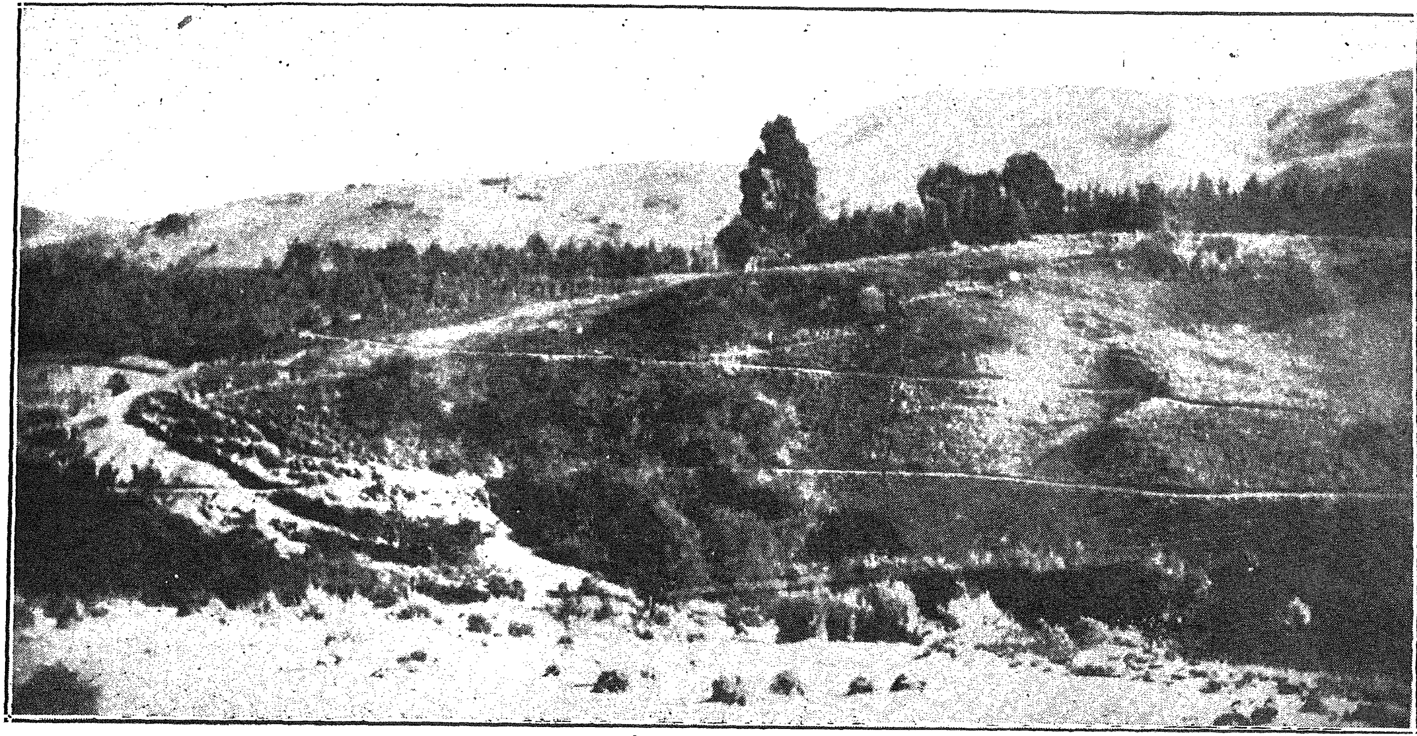

General view of Government Forest Reserve, Stapleford.

THE RHODESIA

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Editor - - *William E. Meade.*

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Editorial.

Contributions and correspondence regarding subjects affecting the farming industry of Southern Rhodesia are invited. All communications regarding these matters and advertisements should be addressed to:—The Editor, Department of Agriculture, Salisbury.

Stapleford Forest Reserve.—During the year 1927 the Government acquired an area of 18,420 acres, situated on the highlands of the eastern border. The area is approximately 30 miles north of Umtali and is ideally situated and suitable for the production of high quality softwoods. The illustration on the opposite page shows the type of country. Tree-planting operations commenced early in 1928, and during the rainy season of 1928-29, 689 acres were put under trees—chiefly conifers—and it is anticipated that during the season 1929-30 another 1,000 acres will be added. Additional land was acquired last year, and the reserve now has an area of 60,305 acres. Within this area there are valuable indigenous forests. These forests are being surveyed and tests made of the various timbers.

The previous owners of the property planted numerous species of conifers and hardwoods. The various species planted have made exceptionally good growth and clearly

indicate the suitability of the locality for the production of high quality softwoods so urgently needed in the Colony. The proposals are to plant an area of approximately 40,000 acres, and in due time high quality timber will be available to replace the present heavy importations of softwoods.

The scenery on the reserve is equal to that of any part of Southern Rhodesia, and when the pines and cypresses and other conifers clothe the hills and valleys, an attractive holiday and health resort will be afforded to the Colonists. The area is being laid out with suitably graded roads and paths, and later on rest huts will be erected for the use of tourists and visitors.

Branding Regulations.—It is thought desirable to publish for general information the procedure to be followed in applying for a brand. An application for a brand should be made to the Assistant Magistrate of the district in which the farm is situated, accompanied by the registration fee (five shillings).

Branding of breeding cattle is not compulsory, but draught oxen working on a public road and slaughter cattle en route to a buyer or auction centre must be branded. In the interests of the owner, however, it is advisable to brand all cattle in order that ownership in the event of cattle straying or being impounded may be established. The branding regulations now permit an owner to brand his cattle anywhere on the near side, with the exception of the hoof. Second or subsequent brands may not be imprinted on top of an old brand, but must be at a distance of not less than one and a half inches from and directly underneath it.

A cattle owner may not select any brand, but will be allotted the next brand available in the three-piece series in use in the district at the time. The three-piece brand consists of a dominant letter representing the district, and below it a numeral and a letter, e.g., Mazoe district, $\begin{matrix}\text{M}\\ \text{3 H.}\end{matrix}$

An old brand allotted before the present regulations became law in 1908 may, with the consent of the owner, be transferred. Many of these old brands consist of initials, numerals, etc., e.g., DH 32 

Sheep Diseases.—The Director of Veterinary Research has requested us to invite our readers to supply him with sick sheep in order that he may carry out detailed observations and experiments with a view to obtaining a more scientific and practical knowledge of the diseases which handicap the sheep-breeding industry in this Colony. He is prepared to purchase such animals at a reasonable price and to refund the cost of transport.

He informs us that as the result of the regular dosing with wire worm remedy and the greater care now taken by flock owners, it is difficult to obtain suitable animals for his purpose in the vicinity of the laboratory.

Elsewhere the sheep industry is one of the most profitable branches of agriculture, and it is most desirable that it should become so in Southern Rhodesia. But before this can be brought about a thorough knowledge of the diseases to which sheep are subject must first be acquired in order that the industry may be built upon a sound foundation.

Agricultural Costings at the Gwebi Farm.—We publish elsewhere in this issue of the Journal the annual balance sheet and profit and loss account of the Gwebi Farm for the year 1st October, 1928, to 30th September, 1929. As will be seen, the farm with its equipment and stock has been capitalised for a sum of £15,498 13s. 8d. and careful costings kept of the various farming operations during the period in question. The result is a profit of £1,054 14s. 6d., or 6.82 per cent., without allowing for interest or the payment of the manager's salary. As is known, the Gwebi Farm is 3,632 acres in extent, of which between 700 and 800 acres are devoted to crops, the principal being maize. As stated in the report, the land and stock at Gwebi are farmed and managed in a similar manner to that recommended by the Department of Agriculture for private farmers, and the data now available will be of the utmost value to the farming community. The present report will be followed during the next few months by statements showing the detailed costs and profits or otherwise of the various sub-departments of the farm, thus allowing each operation and activity to be examined in detail.

We feel sure that the report will create considerable interest throughout the Colony as being the first of its kind published, and we invite readers to use our columns for any comments or criticisms which may be helpful and of general interest.

Tours by Technical Officers of the Department of Agriculture.—The following circular letter has been sent to all farmers' associations by the Acting Secretary of the Department of Agriculture:—

"It is essential that extension work organised by this Department should be done as economically and efficiently as possible, and it is felt that better results would be obtained by officers touring districts and giving demonstrations and advice than by their attending farmers' association meetings and giving lectures.

"I should be glad, therefore, if you would inform me which technical officers in this Department it is desired should tour your district during the present year, and also furnish me with the names of farmers who particularly desire to be visited.

"It would be of assistance if your association could select one or more farms on which demonstrations or short practical talks could be undertaken. It is, of course, impossible to give demonstrations on every farm, but if, as suggested, your association could arrange for the selection of suitable farms for this purpose, it is felt that useful and instructive work could be carried out.

"It will also be realised that it may not be possible to accept any particular date selected by your association for these tours and demonstrations, for the reason that tours may have to be arranged, for purposes of economy, to cover an area served by more than one farmers' association.

"It is hoped that the services of our technical advisers will be freely asked for by every farmer desiring information on matters affecting the growing of crops, dairying, poultry keeping, forestry and all matters relating to farming generally."

A Co-operative Effort.—We publish the following letter from a farmer in the Fort Victoria district as a matter of general interest:—

"Re the native schools. This movement started some three to four years back, but only on a small scale. The object was to get a few head of cattle together and some ruquesa to make beer, and some mealie meal, and on an appointed day a dance was held, when the cattle were killed and eaten, with beer and meal.

"A few young men collect the girls and youngsters from one of the native schools and then go and offer to clean a farmer's lands for cattle, ruquesa or mealie meal, and when the necessaries have been worked for they take them home and hold the feast or dance.

"At first the movement was on a small scale, but this season it was on a much bigger scale, and a number of gangs came out to work. A gang consists of from 20 to 30 young men, girls and youngsters; and when a gang comes to your farm you show them your land, and if it has had the cultivators through it and is fairly clean the gang will agree to weed the land, or rather from 40 to 50 acres of it, for one beast, but should the land be dirty they want more. The farmer has to feed them while working—meal and salt.

"The natives prefer an ox to a cow, but the animal must be in good condition. The meal and ruquesa are worked for in the same way. This year there have been so many gangs out that over 30 head of cattle have been taken away from the farmers, besides the meal and ruquesa. The movement has been confined so far to the Gutu native schools, but may spread to Ndanga and other districts, and happens during the Christmas school holidays only. Mr. ——, who knows the natives well, and speaks the language, doubts whether the natives will come out in a good year, when their own lands need cultivating, but we hope they will.

"I think that every farmer out east from Victoria had the chance of getting his lands cleaned this year."

We understand that similar "schools" are coming out in the Enkeldoorn area.

Marketing of Rhodesian Fruits.—A movement has been initiated by the Rhodesian Co-operative Fruit Growers' Association, Ltd., to organise the fruit growers of this Colony co-operatively for the purpose of supplying local markets with good, wholesome fruit at a reasonable price. The proposal in brief is to form a limited liability company with a capital of £1,000, and to establish a depot in Salisbury where the fruit of members will be distributed to retailers and the consuming public. A meeting of growers and those interested has been convened for 13th March at the Duthie Hall, Salisbury, when a definite scheme will be submitted.

That there is need for such an organisation is obvious from the fact that every year a great deal of locally grown fruit of good quality is never marketed, while the bulk of our requirements are supplied by importations from the south. There is no doubt that the present consumption of fruit could be increased considerably by wisely directed publicity, by effective distribution and by bringing the prices within the means of all classes of the community. The possibilities of fruit growing in Southern Rhodesia have on many occasions been emphasised in the pages of this Journal, and we have the authority of the Horticulturist of this Department for stating that there are areas in the Colony equal to any in South Africa for fruit growing. This being so, there is no reason why the growing of deciduous fruits should not extend beyond the supplying of local needs and markets found for the surplus in the adjacent territories and possibly overseas.

In the meanwhile this attempt to organise the growers on a co-operative basis is a step in the right direction, and we trust the outcome will be the adoption of some scheme which will ensure steady markets and reasonable prices for Rhodesian-grown fruit. It seems to us that the essentials for success are: (1) A constitution fundamentally sound; (2) the whole-hearted support of growers; and (3) efficient and economical management.

The Extent of Empire Agriculture.—Some interesting facts and figures were given by Sir Robert Greig, M.C., LL.D., M.Sc., in his presidential address to Section M (Agriculture) of the British Association at Pretoria. In

the course of his address Sir Robert told his audience that the British Dominions, India and the Colonies cover 24 per cent. of the globe, and they contain 24 per cent., or nearly one-quarter, of the world's population. Of this immense area no precise measure of the full extent of land in agricultural use is available, but the proportion is small. The most intensively cultivated of the larger areas is India; the least intensively cultivated is Australia. In the aggregate only 8.7 per cent. of the total land surface of Canada, India and the Union of South Africa, Australia and New Zealand is under arable cultivation. Only about one acre in every hundred of Australia is under cultivated crops, about two-and-one-half acres in Canada and three acres in South Africa and New Zealand respectively.

In the nine provinces of Canada, the "possible farm land" is 358 million acres, or about one-quarter of the total land area of the provinces, and five and a half times the present total of both arable and pasture. In India, the most intensively cultivated, it is estimated that the cultivable waste land is equal to half the present cultivated area, or about 153 million acres.

Of every hundred head of cattle in the world, forty-four graze on Empire pastures; and of every hundred sheep, thirty-eight are in the Empire. Australia and New Zealand together own approximately as many sheep as the whole of Europe, excluding the United States of Soviet Republics. Evidence of what the Empire might do in grassland products is provided by the figures of imports of live stock products into Great Britain. The British market imports £330,000,000 worth of grassland products annually, which is about one-quarter of the imported goods of all descriptions. Of these foodstuffs which come from the grass, one-half, or about £160,000,000, come from the Empire.

"The Growing Dependence of British Industry on Empire Markets."—This is the title of a brochure recently issued by the Empire Marketing Board and obtainable from His Majesty's Stationery Office, Adastral House, Kingsway, London, W.C. 2, for 1s. net. The enquiry was undertaken by Mr. F. L. McDougall, C.M.G., representative of Aus-

tralia on the Empire Marketing Board, and the author has compiled within a small compass a great deal of valuable information on a subject of vital importance to every unit of the British Empire. Although competition for trade has become intensified in every market of the world, it is seen that the position of British trade is far more favourable in Empire markets than in foreign markets. In a world in which the volume of trade is increasing, Great Britain's share of world's exports fell from 13.9 per cent. in 1913 to 12.1 per cent. in 1925, 11.4 per cent. in 1927 and 11 per cent. in 1928. In Empire markets as a whole Great Britain supplies about 36 per cent. of the imports. With the exception of those parts of the Empire which fall directly within the economic orbit of the United States of America, Great Britain retains a position of definite predominance. In the Empire markets Great Britain's share has tended to decrease since the war, but it is seen from the facts presented that Great Britain is, in most Empire countries, still well ahead of her competitors.

The author produces evidence from the League of Nations to show that in Empire markets, although a large share of the trade falls to Great Britain, yet at the same time the United States of America is making considerable inroads. It is interesting to observe the fact that the Empire, including Great Britain, is by far the largest customer for American products, taking over 40 per cent. of America's exports. European countries are making very little headway in Empire markets, but with the exception of Germany they would appear to have regained the small proportion held in 1913. The position in India is somewhat different from that in other parts of the Empire, for in India, Japan has greatly increased her share of the markets since pre-war years, and in recent years has vied with the United States of America for second place.

It would appear from the report that Great Britain experiences little direct competition in world markets from exports of Empire manufactures, the only source of competition being from certain Canadian industries, such as motors and agricultural machinery.

The conclusion drawn by the author from a general review of Great Britain's position in overseas markets is that it is

in some ways disquieting, but he finds there are specific factors in the industrial situation which afford ground for a more hopeful view of Great Britain's prospects. Of these factors by far the most important is the position which British trade retains in that quarter of the world which is the British Empire.

The predominant position of Great Britain in most of the markets of the Empire is ascribed to a variety of circumstances. In Australia, New Zealand and South Africa, as also in Canada, the influence of sentiment and long established trade relations is reinforced by the system of tariff preference given to British goods by the Dominions. In India, however, Great Britain holds as large a share of the markets as in Australasia. Some Colonies have adopted the preferential system; in others, international agreements prevent such action. The writer points out, however, that it is impossible to compare the position of British trade in the Empire with foreign countries without realising that the Empire provides a series of sheltered markets for British industries. "Thus the development of Empire markets should enable the British manufacturer to increase his output, to reduce his overhead costs and thus to place himself in a better position to meet fierce competition in the foreign markets."

In conclusion, it is interesting to note that evidence is produced showing that Empire countries are developing more rapidly than comparable parts of the foreign world.

AGRICULTURAL SHOW DATES, 1930.

Umtali: 18th and 19th July.
Bindura: 26th July.
Salisbury: 20th and 21st August.
Gwelo: 28th and 29th August.
Bulawayo: 3rd and 4th September.

Dark Fire-cured Tobacco.

HARVESTING AND CURING.

By D. D. Brown, Chief Tobacco Expert.

Harvesting and curing are operations requiring the utmost care and attention, as they govern the ultimate value of the tobacco. The value of the tobacco is dependent upon quality, and unless proper care is exercised in the harvesting and curing stages the financial return to the farmer may be seriously reduced through lack of quality in the cured leaf. Mistakes in either operation cannot be rectified when once they are made. The production of high quality leaf is essential.

Ripening Stage.—The young tobacco plant, when growing vigorously, carries leaves of a deep green colour, and at this stage the leaves are soft and pliable. The intense green coloration denotes a rich supply of nitrogenous constituents which go to make up the living or vital parts of the leaf; these are necessary for the building up of the food supply of the plant. The function of the leaves is the elaboration and storing of the food supply, and at about the time when the flower head begins to develop the leaves have attained their maximum power of elaborating the food supply. This plant food, consisting of starch and other similar substances, is carried from the leaf into the seed head to furnish the necessary nourishment for the development of the seed. This accomplished, the leaves have completed their full task, and they now pass into the period of gradual decay. In practice, however, the plant is "topped" so that the seeds are not allowed to develop. Making a last effort to reproduce itself, the plant now sends out secondary shoots or "suckers," but these too are removed by the grower. Under these circumstances the food built up by the leaves is not carried away

to other parts of the plant, but accumulates in the leaves themselves, with the result that both the size and body of the leaf are increased.

The accumulation of plant food in the leaf induces ripeness, and later gradual decay, unless the leaves are harvested. Should the plants make normal progress, the usual period required for the lower and middle leaves to ripen is about 90 days from the date of setting out in the field; the upper leaves ripen last of all. Actual and personal experience is required before the grower is fully able to tell when the leaf is properly ripe, but the following explanation of the indications may prove of some assistance:—

One of the indications of ripeness is the change in the texture of the leaf, which, from being smooth and pliable, becomes roughened and brittle. This is due to the accumulation of starch granules within the leaf cells. There is also a tendency for the tips of the leaves to curl down and in towards the stalk of the plant. A pronounced change in the colour of the leaf is another indication of ripeness, provided this change is not caused by conditions other than maturity of the plant. In seasons of severe drought or extreme wet the leaves often turn yellow before the plant is fully ripe. Plants affected by disease will also often change colour prematurely. The leaves thus affected fail to cure properly and lack the necessary quality. Under normal conditions the dark green colour gradually changes to a lighter green, also yellow flecks or spots may possibly be distributed over the surface of the leaf. At this stage the leaf should be very waxy and thick and the top leaves practically as long as any on the plant, the web of the leaf, being brittle, cracking instead of bending when creased between the fingers.

Before being harvested the tobacco must be fully ripe, otherwise difficulties will occur in the curing and the results will not be satisfactory.

Harvesting.—The tobacco may be harvested either by cutting down the entire plant or by removing the leaves individually from the stalk of the plant. The former method is usually employed in the harvesting of dark fire-cured tobacco. The top of the plant should be steadied with one hand while the stalk is being split down the centre from the top to within six inches of the ground. Then, by gripping

both sections together about half-way down the stalk, the plant should be bent slightly down and away from the operator and a slanting cut made just above ground level to sever the stalk from the root. The severed plant should not be allowed to fall over on to the ground, but should only be released after being carefully placed down with all the underside leaves lying flat on the ground. If the tobacco is subjected to rough handling or allowed to fall over with the leaves bent up underneath the plant, irreparable damage will be caused through breakage and bruising of the leaves.

After being harvested the tobacco should not be left exposed to the direct rays of the sun for too long a period, otherwise the leaves are liable to become sun-scorched or scalded, in which case blackened or brownish areas will form on the tissue of the leaf. The plants should be picked up and hung astride the curing sticks by pushing the stick in the fork formed by the split section of the tobacco stalk. Each stick will hold from six to ten plants, according to the size of the tobacco.

When filled with their complement of plants these sticks should be hung on temporary racks in the field or placed in heaps on the ground in order to wilt the tobacco before loading on a wagon or trolley for cartage to the curing barn. A slight degree of wilting only is required to ensure that the cartage of the tobacco may be accomplished with a minimum of damage through bruising and breaking of leaves. When loading the tobacco on the wagon the sticks should be carefully stacked with the butts of the plants facing outwards. In the event of the fields being at some distance from the barns, a light covering of hessian should be used to protect the top layers of tobacco from the direct rays of the sun.

Packing the Barn.—In packing the barn the proper procedure is to place the first stick of tobacco on the top tier, the next stick on the second tier, and so on down until the bottom tier is reached. This procedure should be repeated until that room or section of the barn is completely filled. The sticks are spaced at six to nine-inch intervals along the tier, care being taken not to crush the tobacco leaves between the sticks or to damage the tobacco by placing the next stick directly beneath those plants hanging from the tier above.

Any bruising or damage caused during the filling of the barn will show up on the cured leaf and detract from the value.

Curing.—The "yellowing" of the leaf constitutes the first stage in the curing process and is accomplished by allowing the tobacco to hang in the barn from four to six days prior to the lighting of the fires. During the "yellowing" stage the temperature within the barn should register roughly 85 degrees F., and the relative humidity should be neither too high nor too low. If the atmosphere is too dry the leaf will tend to dry before the requisite yellow colour is developed. A saturated atmosphere will, on the other hand, render the tobacco liable to damage through pole sweat.

The humidity in the interior of the barn can be increased by wetting the floors if necessary or by keeping all doors and ventilators closed during the day and open during the night when the atmosphere is moist. In the event of the humidity becoming excessive, either through artificial or natural causes, the order should be reversed and the barn closed overnight and opened during the day, provided the weather is fine. Small fires may also be lighted before the leaf is fully yellow in order to reduce the humidity.

After four to six days, when most of the tobacco in the barn is yellow, slow fires should be made in shallow trenches inside the barn about two feet from the surrounding walls and down the centre. These smouldering fires, placed at intervals of about six feet in the trenches nearest the walls, will usually be sufficient during the first few days of curing. The temperature inside the barn should be gradually increased and should range between 85 degrees and 95 degrees F. until the leaf is thoroughly yellow. If the outside atmosphere is dry and cool during this stage it may be necessary to introduce moisture into the barn to prevent the leaf drying out prematurely. Water should be poured on the floor and lower portion of the walls, care being exercised that the floor (particularly an earthen floor) is not over-saturated.

When wetting the barn floor it is advisable to sprinkle water lightly at frequent intervals rather than pour down a great quantity in one operation. After the tobacco is a pronounced yellow the temperature requires to be increased to 100 degrees F. and maintained there until the tips and edges

of the leaves turn brown and begin to curl. This stage is generally reached in three to five days after lighting the fires. The fires must then be extinguished so that the barn will cool down and allow the sap to become uniformly distributed through the leaf to ensure an even colour. After the barn cools and the brown coloured areas of the leaves become soft and pliable, fires should be relighted and the temperature in the barn raised to about 105 degrees F. When the brown colour begins to spread from the edges of the leaf towards the midrib and the brown coloured part of the leaf becomes brittle, the fires should again be extinguished to allow the barn to cool down and the sap to spread. This process is repeated, and as the curing progresses the temperatures should be increased each time after the sap spreads. When the entire leaf is a uniform colour the midribs are dried out and the curing process completed. The maximum temperature reached in the barn should not be much in excess of 125 degrees F. and should not exceed 130 degrees F.

The desirable qualities of the cured leaf may be seriously impaired through being subjected to excessive quantities of smoke, which may leave heavy deposits on the leaves and blacken them to a great degree. Certain wood gives off an unpleasant odour when burned, and should this be taken on by the tobacco, the aroma of the cured leaf will be ruined and the commercial value will be considerably reduced. The fuel used for burning in fire-curing barns should be selected from hard woods which tend to smoulder rather than flame up, and do not create any unpleasant smell whilst burning. When available, maize cores are also satisfactory for use as a fuel.

During the earlier stages of curing a heavy cloud of smoke is essential, but in the later stages little or no smoke is required. When necessary the fuel may be dampened with water to create a good cloud of smoke. In order to raise the temperature within the barn the number of fires should be augmented. There should not be any increase in the size of the fires already lighted. Large fires tend to dry out the tobacco too rapidly in localised areas and are also a source of danger in setting alight to the barn. As a precautionary measure, during the period of "firing," strips of wire netting should be suspended close under the tobacco hanging immediately above the fire trenches. The curing

process may be carried on by retaining the fires in the barn overnight as well as during the day, or the fires may be extinguished each evening and relighted every morning. The latter method is the general practice in Southern Rhodesia and is recommended instead of the practically continuous "firing" system. The fires should be extinguished at sunset, and if the weather is fine the barn doors should be left open overnight. Early next morning the fires should be relighted and the barn closed up. This procedure should be followed for eight to nine days, at the end of which period the tobacco should be a uniform colour ranging from a light reddish brown to a dark brown. After the desired colour has been secured and the web of the leaf has become brittle, the midrib should then be dried out, either by continued use of open fires or by the use of hot air flues passing through the barns from exterior furnaces. The use of hot air flues for the final stages of curing the tobacco is recommended, because the risk of fire is considerably reduced and the curing period is shortened by approximately one week. The normal time required to cure a barn of dark fire-cured tobacco is roughly three weeks, but where the barn is fitted with flues and furnaces the curing will normally be completed in about two weeks.

Conditioning.—After the tobacco in the barn is cured the leaf is extremely brittle and cannot be removed without serious damage unless it be conditioned and made soft and pliable before being handled. Tobacco becomes soft when exposed to damp atmospheric conditions; these conditions may be brought about by the use of water, steam or a combination of both in the curing barn. A conditioning pit may also be used.

When bringing tobacco into condition through the combined agency of water and the natural moisture of the atmosphere the barn should be kept well wetted by sprinkling water on the floor and the walls below the bottom tier. The doors and ventilators should be kept open overnight and closed during the day, except on dull, misty days, when they should be left open to allow the moist air to enter the barn.

Conditioning tobacco by means of filling the barn with steam is generally found to be more expeditious than the above method. The use of a steam outfit makes it possible

to condition the tobacco at all times and renders the grower more independent of weather conditions.

The general practice is to have a large steam boiler (about 10 to 12 h.p.) placed conveniently to the curing barns and grading shed. Steam pipes are led from the boiler to the barns and another connection to the steaming boxes in the grading shed. From the main pipe line running along the front of the barns a connection is led to the centre of the floor of each barn, where a right angle bend is fixed and a short length of pipe fitted. Over each of these short outlet pipes an old plough disc or similar object to make a spreader is placed about 12 inches above the end of the pipe; this prevents a jet of steam being blown up into the tobacco and causes a better distribution of steam over the whole area of the barn floor.

When conditioning tobacco by steam the door and ventilators are closed after the barn has been cooled down and the steam turned on. If the weather is very dry it may be necessary to pour water on the floor and lower portions of the walls of the barn in order to help to saturate the atmosphere within the barn.

The tobacco on the sticks hung on the lower tiers will come into condition first; these sticks should be removed as soon as the tobacco is soft enough. This will prevent the tobacco on the lower tiers from damage through becoming too moist, and will also make room for the steam to rise to the upper tiers. To be fully effective, steam must be moist; super-heated or dry steam is useless. The boiler should therefore be kept at a low pressure.

Tobacco can also be brought into condition by being placed in a conditioning pit; this is the most desirable means of conditioning the leaf. The barn should be left open overnight and the floor and lower walls wetted. Next morning the tobacco should be ready for removal from the barn, and should then be hung up in the conditioning pit until the proper amount of moisture has been absorbed by the leaf. Should climatic conditions be such that one night in the curing barn with open door and ventilators is sufficient to bring the tobacco into proper condition, it will not be necessary to use the pit. When necessary, steam can also be used to make the tobacco just soft enough to handle without

breakage, and the conditioning process can be completed in a conditioning pit.

When both a steam boiler and a conditioning cellar are available it may be a good plan first to steam the tobacco until it can be safely removed from the barn; the sticks are then hung up in the conditioning pit until the leaf is in proper condition for bulking.

The correct condition for the leaf to be in for bulking is indicated when the web of the leaf and the lower half of the midrib are pliable and the upper half of the midrib is only slightly supple. The characteristics of the cured leaf are either improved or damaged in the process of bulking, irrespective of the method by which it was cured. If reasonable care and attention are given the leaf improves in the bulk. When bulked too dry the necessary changes cannot take place in the leaf and the quality of tobacco suffers. The leaf also breaks up and causes a lot of scrap. If bulked in too high condition, the leaf is liable to ferment and go mouldy.

When the tobacco is in condition as previously described the leaves are stripped from the stalk and roughly graded. Each grade should then be bulked down separately. It sometimes happens that some of the midribs or "fatty" stems contain much moisture, and if placed in the bulk will cause the tobacco to mould. When stripping, a careful look-out must be kept and all leaf with "fatty" stems put on one side, and after being re-strung, should be hung up to dry thoroughly.

The sticks may be hung up under the roof of a suitable building or they may be placed in a barn in which tobacco is being dried out, say, when the temperature is about 120 degrees F. to 125 degrees F.

Bulking.—The bulking shed should have a water-tight roof, as any water falling on the bulks will cause damage to the tobacco; the floor should also be dry and the walls weather-proof. A strong light is detrimental and will bleach the leaf; only sufficient lighting to give good visibility is all that is required in a bulking shed. Ventilation should also be provided for. Inside the building beds or platforms are placed and so aligned that there is easy access to both sides and ends of the tobacco bulks. These platforms are made

by placing boards or poles very closely together on cross members supported on brick pillars, which are built up high enough to leave an air space of about 12 inches between the floor and the under-side of the bed. On most farms, where the only available material for construction of these platforms is rough timber, which would damage the first layer of leaf, it is essential to place reed mats or hessian on top of the beds before bulking down any tobacco. Tobacco bulks may be built either with a circular or rectangular base, the latter being the most economical as regards floor space. The bulks can be made of any suitable length, and should be at least 6 feet wide and about 6 to 7 feet high. When placed in very small bulks the tobacco does not have much chance of improving in quality, as the leaf tends to dry out too quickly.

When making a bulk of tobacco the butts of the leaf must be placed to the outside and the tails face towards the inside. The tobacco is placed in position a handful at a time, and the outer edge forming the sides and ends of the bulk should be completed first. After this is done a second layer of leaf is placed with the butts about 4 inches in from the butts of the tobacco forming the first layer. This forms a bond and keeps the outside of the bulk from being displaced. Leaf forming the centre of the bulk need not be so carefully placed as to have the butts facing any particular direction. When one complete layer has been bulked the next layer is placed on top, starting from the outside and working towards the centre, as before; this process is continued until the bulk is completed. The corners may be slightly rounded off, as it is more difficult to make them square. The sides and ends of the bulk should be kept straight and perpendicular.

When bulking, the leaves must be straightened out and not be bent double, so that the tip lies on the butt. Tobacco should never be "pastelled" or flattened out, but should be bulked just like it comes off the stick. Weights are placed on the top of the bulk to press the tobacco down. On the outside of the bulks no leaf should be seen—only the butts of the tobacco should be visible.

The bulks of tobacco should be subjected to regular and careful inspection, and should any tobacco be found to be heating up or fermenting too much through the leaf being in too high condition, the bulk must be broken down and

re-built after the leaf has been shaken out and aired. When turning bulks the tobacco which formed the centre of the old bulk is placed to the outside, and in the same way the bottom tobacco is placed on the top of the new bulk; this assists in attaining greater uniformity in the leaf.

Grading and Baling.—Fire-cured tobacco may be fully graded directly after it is completely cured, or it may be left in the bulks and graded after the end of the curing season. The initial grading should be done when the leaves are being stripped off the stalk. The leaves are assorted into three main grades, namely, *trash*, *lugs* and *leaf*.

Trash consists of sandy and badly spotted or broken leaves.

Lugs consist of the smooth, usually light brown coloured leaves, taken from near the bottom of the plant.

Leaf includes all the sound, even coloured leaves taken from the plant after the removal of the trash and lugs.

The leaf grade should then be sub-divided into final grades according to colour, size, body and texture. The very heavy, oily and waxy leaf should not be mixed up with leaf which is lighter in body and is not so oily and gummy. The former type of leaf is that which is taken from the top of the plant, and the latter type usually comprises the middle leaves. The graded tobacco should be tied in "hands"; the leaf grades should contain from eight to twelve leaves to a "hand," whilst the lug grades should contain from twelve to eighteen leaves.

The hand of tobacco is tied by a leaf suitably folded to form a binder, the midrib being placed to the inside so that it will not be visible when the hand is bound. The leaves are held in the left hand, and with the other hand the butts are beaten down until they are all level. The binder is then held with the tip pressed firmly by the left thumb against the hand of tobacco and wound round until about four inches remain; the butt end of the binder is then pulled across through the middle of the hand of tobacco, and keeps the tie leaf securely in place. Only leaf of similar grade and length should be tied in the same hand of tobacco. The

tie leaf must be of the same grade as the tobacco in the hand; a leaf of medium length is best suited for the purpose.

It is not desirable to bring the binder too far down the hand; the top edge of binding should be level with the butts and the lower edge not more than three inches below the top.

After the tobacco is tied in "hands" it is bulked or stored until there is a sufficient quantity of a grade to make a bale. The operation of bulking is similar to that of bulking the crop when first conditioned, the only difference being that in the latter instance the leaf has not been tied into hands. Another method is to place the hands on sticks and hang them up on suitable racks placed in the grading shed. If the foregoing method is employed, care should be taken to divide the hand at right angles to where it was divided for the fixing of the butt end of the tie leaf, otherwise the binder will tend to unwrap itself when the hand is straddled over the stick.

The condition of the leaf is very important in the baling process. Too much moisture may cause mould or darkening of the leaf, with resultant loss in value, and too little means breakage and scrap. For baling, the correct condition is when the body and tip of the leaf are pliable, but not soft, and the midrib breakable but not brittle for most of its length. The inferior grades are usually not tied in hands, but the midribs are removed and the tobacco is baled as "stripts." The "stripts" are baled in similar fashion to the loose leaf grades of flue-cured tobacco.

Baling Loose Leaf and "Stripts."—The method of baling loose leaf and "stripts" is first to place a strip of hessian along the bottom and up one end of the baling box, leaving the other end of the hessian protruding about 12 inches out of the bottom, with the removable end closed down on it. The length of hessian required for each bale is nine feet. Leaf is then placed in layers with the butts towards the end of the press and the tips towards the centre; this is repeated at the other end, leaving the tips of both layers meeting or overlapping along the middle of the box. Another layer to form a bond is placed, butts towards the end of baling box, about six inches in from the end of butts of first layer.

To render the bale more solid and for the protection of the butts a layer of less thickness is placed at right angles

across the ends of the bale. These "header" layers should be placed with butts tightly packed into the corners and should just cover up the butts of the leaf forming the layer beneath. The next layer placed in the box should be in the same position as the one forming the beginning of the bale. The layer which forms the bond, in the middle of the bale, is alternated; for instance, if the first middle layer is placed butts to left end of press, the next one should be reversed so that the butts face the right hand end.

Each layer should be about one-and-a-half inches thick at butts. These operations are repeated until the required quantity of tobacco is packed into the baling box. Broken midribs are a fruitful source of scrap, and the same care which has been exercised from the time the tobacco was removed from the barn and through subsequent handlings should still be continued in the baling process.

In order to press down each layer of tobacco into position in the box, a smooth board about 12 inches wide and 23 inches long should be used, but extreme care must be taken, otherwise the stems of the tobacco may be broken. When the requisite amount of tobacco has been packed in the baling box, the top of the press is placed on the tobacco and pressure applied by means of the screw until the depth of the bale is 16 inches. The standard size bale measures 34 ins. x 24 ins. x 16 ins. deep, and should not weigh more than 200 lbs.

It is quite possible to get a greater weight of tobacco into the cubic capacity of a standard size bale; this, however, would result in bruising and thereby reduce the value of the leaf. Too much moisture in the tobacco or too great a pressure will make a standard sized bale weigh heavier than the 200 lbs. limit. If it is found that the bales are being turned out overweight, it would be as well to watch the condition and pressure of the tobacco.

When packed too wet or with too great a pressure, the leaf turns darker in colour and may become mouldy. It will also be difficult to open a tightly pressed bale and remove the leaf without damage.

Baling Tobacco tied in Hands.—The hands of tobacco are placed in single layers in the press, and the bale is built up in a manner similar to that described for loose leaf and

stripts. The bales are of the standard size, but should weigh approximately 200 lbs. When packing, care must be taken to see that the leaf is in proper condition, and that all the hands are of the same grade; mixed grades will cause a reduction in value of the bale. The bale is kept under pressure for about twelve hours in order to allow the hands to bind properly. As soon as the pressure is released the hessian covering should be sewn at once to prevent the bale springing, a hitch stitch being used. The most convenient arrangement is to have more than one baling box, so that baling may be carried on without undue delay. These boxes are pushed under the screw and pressed while the next box is being packed. When sufficiently pressed the top of each box is kept down on the tobacco by iron bars pushed through holes drilled at the correct level in each side and so holding the tobacco under pressure after the box is removed from under the screw.

Another type of baling box is provided with loose bottom, and the sides are hinged at the corners to permit of easy removal from under the press when the bale is fully pressed down. After the sides of the box have been folded back on their hinges and removed from encasing the bale, steel bars with suitably formed ends are hooked over each end and hold firmly together the boards on top and bottom of the bale. With this type of baling box the hessian is arranged differently to when a non-collapsible box is used, two pieces of hessian each 4½ feet long being required. One strip is placed on the loose bottom and an overlap of nine inches folded over and under either end of the board before any leaf is placed in the press. A similar strip is put on top of the tobacco before it is finally pressed, being so placed that the overlap comes up over each end of the top board. After the sides are removed and before the hooks are placed in position, both the overlaps at each end should be drawn so that the hessian can be sewn before the boards are removed from the bale. After the tobacco bales are properly sewn and stencilled with the necessary distinguishing marks they are ready for despatch from the farm.

In addition to the hessian covering, the bale may be encased in a waterproof paper lining. The use of a paper wrapping, placed between the tobacco and the hessian, will prevent the leaf from becoming too dry, and reduces the

damage caused through rough handling of the bales in transit.

It is the usual custom to store the baled tobacco on the farm until there are a sufficient number of bales to make a wagon load, or, in the case of wet weather, until weather conditions are favourable. It is important to store baled tobacco in a suitable manner, as neglect of a few common-sense precautions will seriously affect the value of the leaf. The bales should be placed on platforms raised off the floor in a similar manner to the bulking beds. The top surface of these platforms should not be rough or uneven, otherwise the hessian will be torn and the tobacco damaged. It is not advisable to have the bales stacked up too high; three bales placed one on top of another (flat side down) is high enough. These bales require frequent turning, so that the bottom bale, when removed, is placed on top. If the same bales were always left at the bottom, the continued pressure, caused by the weight of the top bales, would tend to bruise and damage the tobacco. When loading up for transport from the farm, care should be taken to have the bales firmly and securely placed flat down on the wagon. The writer has frequently observed wagon loads of tobacco bales on the road to the nearest railway station without any covering to protect them from the sun or possible showers of rain. It is hardly necessary to point out that this is a most unsatisfactory arrangement, and that suitable protection should be provided for the tobacco *en route* to the warehouse.

Inexperienced growers would obtain great benefit by actual demonstration in the conditioning and handling of tobacco, as there are certain details which cannot be properly grasped through perusal of reading matter alone.

In conclusion, it may be stated that unless reasonable care and proper attention to detail are exercised in the handling of tobacco, the maximum financial returns cannot be fully realised, and the tobacco industry will not make the full amount of progress of which it is capable.

Agricultural Costings at the Gwebi Farm.

By H. G. Mundy, Dip.Agric., F.L.S., Chief Agriculturist; and J. Hick, Accountant.

It was decided by the Government, about five years ago, that the operations of the Gwebi farm should be conducted on commercial lines, in order that the institution might serve the purpose of a demonstration farm for the type of land of which it is representative. This decision was at once put into effect, but it soon became apparent that the demonstration would be of little practical value unless accompanied by accurate costings of all the farming operations in progress.

At the commencement, the burden of keeping all the books and costs was placed on the shoulders of the farm manager and his staff, but this proved unsatisfactory, since it not only divorced the manager from his proper duties of supervision and direction of the farm, but also provided insufficiently for a reliable check of the final figures. Preliminary and somewhat incomplete costings were kept in this manner for rather more than 12 months, after which on the 1st October, 1928, a change was made. A stores and accounts keeper was posted to the farm, and this officer, under the direction of the farm manager, is responsible for all issues of stores, for the keeping of all labour sheets and records, for the tabulation of the various expenses incurred on the different operations in progress, and so forth. The actual allocations of labour—native, animal and mechanical—and of all supplies drawn from stores, are made by the member of the European staff actually supervising such labour or using such stores.

The farm books are kept in the office of the accountant to the Agricultural and Veterinary Departments, and a mem-

ber of the staff (Mr. Hick) of that office gives as much of his time as is necessary to the keeping of these books. He also visits the farm once a month, or more often if necessary, in order to maintain a careful check on all figures supplied to him from the farm office.

In practice it has been found impossible to carry on the Gwebi farm as a strictly commercial undertaking. Being a Government demonstration farm it receives large numbers of visitors throughout the year, both Rhodesians and prominent persons from other parts of the world. Much of the manager's time is taken up in conducting such visitors over the property, and more labour is utilised in maintaining outward appearances than can be justified on purely commercial grounds.

Sixty acres of the arable land—to be increased to 80 acres in 1929-30—are set aside for experiments conducted on behalf of the Rhodesia Agricultural Union, and certain additional expenditure is incurred on the crop account in obtaining detailed figures of these results.

The carrying on of all the farming operations in such a way that detailed costs can be kept also adds to the general expenditure. For example, each field of maize in each rotation system is reaped, shelled and weighed separately, and thus increased charges are incurred for native labour, European supervision, and so forth. During the year a new motor road was opened through the farm, entailing the expenditure of £102 8s., from which the farm reaps little, if any, benefit.

It is probably inevitable, therefore, that costs of production should be somewhat higher than on many well managed private farms. In reviewing the year's work, these facts should receive due consideration, but none the less it is believed that the publishing in detail of all the costs cannot fail to prove of material help to farmers in general throughout the Colony. The facts thus revealed will also be of assistance to the various advisory officers of the Department of Agriculture. The Gwebi land and stock are farmed and managed in a similar manner to that recommended by the Department for private farmers, and the costings kept will quickly reveal whether this advice is well founded or not. Further, it is not claimed that the methods followed on the

farm cannot be improved upon, and it is hoped that costings will shortly indicate in what directions such improvements can be effected.

A system of recording suitable to local conditions has had to be introduced, and in this process the greatest assistance has been rendered by Mr. T. J. Needham, accountant to the Agricultural and Veterinary Departments, without whose enthusiastic and able guidance the very satisfactory system now adopted would not have been evolved.

The first costing results were published in January, 1929, when an article appeared in this Journal showing the costs and profits of fattening a batch of steers for disposal on overseas and local markets. The present report presents the annual balance sheet and profit and loss account of the farm for the year 1st October, 1928, to 30th September, 1929, and this in turn, as time permits, will be followed during the next few months by statements showing the detailed costs and profits or otherwise of the various sub-departments of the farming operations.

For those unacquainted with the conditions at the Gwebi farm, it may be explained that the property is 3,632 acres in extent, is sub-divided into numerous paddocks with water supplies in most of them, and that between 700 and 800 acres are actually under the plough. Maize is the principal cash crop, and about half the arable land each year is planted to this cereal, the remainder being sown to other crops, principally for stock feed and to green manures. The arable land is worked under five different systems of rotation and manuring, all of which are believed to be practical and economic. It is desired to ascertain which of these is the most profitable over a number of years.

All ploughing is at present done by oxen, and an average of six to seven spans of bullocks is maintained. These animals are bought young, worked for three to four years, and are then fattened and sold for slaughter.

A combined pedigree and grade herd of Friesland dairy cattle is being built up, and at the time of writing, numbers 120 head.

Grade bull calves are slaughtered at birth; all calves reared are bucket fed, and the most of the herd are still immature animals or cows in their first lactation period.

It should be pointed out that so far as live stock are concerned, the farm is not yet fully developed, and another 100 to 150 head of cattle could be kept with advantage. Fifty to 70 beef steers are fattened each year, but the majority of these animals are bought in as stores and are put up for fattening almost at once.

Middle White and Large Black pigs are kept, but as yet only in comparatively small numbers. In August of the farm year reported upon, 10 pedigree Shorthorn heifers and two pedigree bulls of the same breed, recently imported from Great Britain, were placed on the farm. These animals are as yet unproductive. A small flock of sheep was on hand at the beginning of the year, but owing to its non-success it was disposed of, resulting in a small loss.

The average milk yield from the cows in milk was 3.2 gallons per diem during the year, and a total of 29,060 gallons of milk was produced. The maize crop consisted of 3,760 bags, of which 1,952 bags were retained on the farm, while the remainder was marketed through the Farmers' Co-operative Society, Ltd., Salisbury.

The following explanations of various items in the balance sheet and the profit and loss account are supplied in order that readers unfamiliar with the intricacies of accountancy may better be able to analyse and understand the returns.

BALANCE SHEET AND PROFIT AND LOSS ACCOUNT FOR THE YEAR ENDED 30TH SEPTEMBER, 1929

Before dealing with the final accounts and balance sheet, it will simplify matters to explain the methods of allocating the various charges, the chief of which are native wages and food, stores, ox labour, artificial fertilisers and farm manure, salaries and allowances of manager and staff, and renewals and depreciation of machinery, vehicles, tools and equipment.

Native Wages.—Each native is issued with a book containing 31 work tickets, and an equal number of slips on which the assistant in charge of the gang records daily the nature of the work performed, tears out the ticket and hands it in at the office. The tickets are filed, and at the end of each month the details are entered on large allocation sheets

showing the number of shifts worked on each job and the amount paid for each shift. These sheets are then forwarded to the head office, where, after being checked, they are summarised, and at the end of the year each allocation is debited to the account concerned.

Native Food.—All native food bought or issued from stores is debited in the first place to a native food account, and at the end of the year the total of this account is divided by the total number of native labour shifts, giving the cost per shift. These amounts are then debited to the correct accounts.

Stores.—This account is debited with the purchase price of all stores purchased, such as paraffin, petrol, bone meal, etc., and also all crops, etc., produced on the farm. This year crop products have been taken in at a fair estimate of their value. As all crops with the exception of maize are grown for farm use, they will in future be taken into store at the cost price, as revealed by the cost accounts. An assistant on the farm has control of all stores, which he issues as and when required. Each issue or receipt of stores is immediately recorded, and the vouchers are submitted to head office, where the quantities are recorded under the various allocations. These issues are then introduced into the main books and charged up at the average purchase price for the year.

Ox Labour.—Each span of oxen is issued with a book of tickets, similar to the native work tickets, on which the assistant records the number of hours worked and the work done. These are collected and dealt with in the same manner as the native food shifts. The charge for grazing has been taken at 6d. per head per month. This figure has been taken into the cost accounts, but not the accounts now being dealt with.

Artificial Fertilisers and Farm Manure.—The cost of artificial fertilisers is charged over two years to the fields to which they are applied, on the basis of 70 per cent. of the cost the first year and 30 per cent. the second year. Farm manure is charged for at 10s. per ton over four years on the basis of 50 per cent. the first year, and 25 per cent., 12½ per cent. and 12½ per cent., respectively, for the three following years.

Salaries and Allowances of Manager and Staff.—The charge for manager's salary and allowances is spread over all the operations of the farm in proportion to the total of all other expenditure on each operation. Those of the stockman are charged to live stock only in proportion to the expenditure on each section of live stock, and finally those of the field assistant are charged against crops in proportion to the acreage under each particular crop.

Renewals, Maintenance and Depreciation of Machinery, Vehicles, Tools and Equipment.—The above charges on grinding machinery have been allocated in proportion to the paraffin consumed on all foodstuffs ground; those on haymaking machinery have been charged to hay crop; those on other farm implements in proportion to the ox labour employed on each crop; those on tools and equipment in proportion to the native labour.

Sundry Expenditure has been allocated to crops and live stock in the proportions they bear to the total expenditure.

The separate items in the final accounts may now be considered.

CROP ACCOUNT.

Expenditure.—The figure of £1,912 12s. 5d. includes all expenditure charged against crops in respect of native wages and food, seeds, ox labour and sundry purchases, together with the allocated proportion of the costs of fertilisers and farm manure, renewals, and the maintenance and depreciation of machinery, vehicles, tools and equipment.

Crop Revenue.—This figure represents the total value of all crops produced on the farm during the year 1st October, 1928—30th September, 1929, taking maize into store at 7s. 9d. per bag, and all other crops at a fair valuation. In future years it is proposed to take in all crops at their actual cost of production price.

Profit on Stores Account.—As explained above, crops were taken into store at a fair estimated value, and the profit shown is the excess of the final sale price over this figure after realisation of all crop produce sold.

LIVE STOCK ACCOUNT.

No attempt should be made to arrive at the profit or loss on any particular class of animals, as various factors have to be taken into consideration before the true profit or loss can be ascertained.

Friesland Herd.—A bull valued at £50 was issued free to a farmer to replace one which died some months after his purchase of it, although the farm was not legally liable to replace the animal. The sales and issues credited to the dairy herd comprise the following—milk, cream, butter and separated milk issued to the staff and fed to calves and pigs, sales of milk, cream, butter and separated milk to settlers in residence on the farm and sales of cream to the Creamery.

Heifers and Calves.—The only revenue from this source is in the form of the increase in value of the herd.

Fat Oxen.—This item includes all costs of feeding and attendance, together with the purchase price of all bullocks sold and of one which died. It also includes the cost of feeds fed to bullocks still on hand and unsold at the 30th September. The actual profit on the fattening of these cattle is revealed by the detailed statement for fat oxen which will be published later.

Pigs.—The cost of feeding and maintaining the breeding stock is included in this item. Pigs are on rather a different footing from fat oxen, since the former are bred and fattened on the farm, whereas many of the latter are expressly purchased for fattening. Towards the end of the year, however, weaner pigs were purchased, and in due course a comparison of the results of the two systems will be published.

It may further be noted that owing to limited accommodation for pigs, the number kept was comparatively small, and separated milk being unsaleable and in excess of requirements it was fed *ad lib.* to the pigs, often in excess of the amount which they actually required, thereby adding to their cost.

Sheep.—The sheep did not thrive, and it was decided to dispose of the flock. This resulted in a loss of £36 2s. 7d.

Show Cattle.—The expenditure shown represents the cost of preparing the animals for the Show, entrance fees, railage to and from the Show, and sundry items incurred in exhibit-

ing the animals. The amount of £27 was won in prize money, but it was decided to refund all such moneys to the Show Society, and the live stock account has suffered to the extent of the above sum.

Working Oxen.—This item includes the wages and food of natives casually employed in connection with the working oxen, salt and bone meal fed to the animals, and a proportion of the salaries and allowances of the manager and stockman.

Shorthorns.—These pedigree cattle represent a value of £1,263 19s. 5d. They are at present unproductive of revenue and will not become productive until their progency is ready for sale and distribution throughout the Colony for the benefit of the cattle industry.

General.—During the year certain expenses occur which cannot be definitely allocated to any particular section of the live stock, and these costs are charged to a general account.

Upkeep of Dip Tank.—This is the cost of dipping fluid, maintenance of the dip tank, and natives employed on dipping.

PROFIT AND LOSS ACCOUNT.

Where it is considered that any portion of any one of the items appearing in the profit and loss account forms a fair charge against either the crops or the live stock, that portion has been allocated against that particular account.

The item calling for most comment is the salaries and allowances of the staff. During the year under review several of the staff proceeded on leave or for other reasons had to be temporarily replaced.

The salaries of these officials on leave, together with the proportion of the salaries and allowances of the other officials who replaced them—not chargeable to crops or live stock—are represented by a figure of £639 8s.

Profit.—The actual profit of £596 14s. 6d. shown in the profit and loss account represents a rate of interest of 3.85 per cent. on the capital employed in the farm at the beginning of the financial year. If the amount of the salary paid to the manager is taken into account and regarded as a profit, as would probably be the case with a private farm on

which the owner is the manager, the profit for the year is increased to £1,056 14s. 6d., which represents a rate of interest of 6.82 per cent.

GENERAL ACCOUNT.

This shows the actual profit made by the farm after charging salaries and allowances, plus the grants from the Treasury by way of capital expenditure and salaries.

BALANCE SHEET.

The item Sundry Debtors in the balance sheet chiefly represents payments from the farm account on capital expenditure recoverable from the Treasury.

The following are the average prices which have been charged throughout the year for all dairy items and stores utilised on the farm.

		£	s.	d.
Dairy Produce—				
Butter	per lb.	0	2	0
Cream	per lb.	0	1	4
Milk, separated	per gal.	0	0	2
Milk, whole	per gal.	0	0	8
Stores—				
Beans—				
Dolichos (seed)	per 100 lbs.	0	15	0
Jack (seed)	per 100 lbs.	0	15	0
Velvet (seed)	per 100 lbs.	0	15	0
Bone meal	per ton	15	10	8
Bran	per ton	12	1	8
Cement	per bag	0	14	2
Charcoal	per bag	0	2	6
Cotton (seed)	per lb.	0	0	0.6
Cotton cake	per ton	7	6	5
Fertiliser—				
Bone and super.	per ton	8	5	4
Double potato	per ton	15	8	2
Sulphate of ammonia	per ton	15	13	9
Raw rock	per ton	5	16	3
Nitrate of soda	per ton	15	13	6
Muriate of potash	per ton	12	16	6
Superphosphate	per ton	6	19	6

		£	s.	d.
Grain bags, new	each	0	1	$2\frac{1}{2}$
Grain bags, second-hand	each	0	0	9
Ground nuts	per bag	0	12	6
Ground nut cake	per ton	10	7	0
Hay—				
Bean	per ton	2	0	0
Bean and mealie	per ton	1	0	0
Ground nut	per ton	2	0	0
Kinvarra oat	per ton	3	0	0
Veld	per ton	1	0	0
Kudzu vine roots	per bag	0	5	0
Lime, building	per bag	0	8	2
Lime, agricultural	per ton	0	15	0
Linseed	per lb.	0	0	4
Maize	per bag	0	7	9
Majordas	per ton	0	10	0
Majordas seed	per lb.	0	1	0
Manna, Boer	per lb.	0	0	3
Manna, red	per lb.	0	0	3
Manure, farm	per ton	0	10	0
Oat chaff	per ton	0	10	0
Oats, Kinvarra	per 100 lbs.	1	0	0
Oats, Kherson	per 100 lbs.	0	15	0
Paraffin	per case	0	15	10
Petrol	per case	1	1	3
Potatoes	per bag	1	0	0
Potatoes, sweet	per ton	0	10	0
Salt	per ton	4	8	11
Silage	per ton	0	10	0
Soap	per case	2	4	1
Sunflower meal	per ton	2	10	0
Sunflower seed	per 100 lbs.	0	10	0
Sunn hemp seed	per 100 lbs.	1	10	0
Tillantin	per lb.	0	3	8
Twine	per lb.	0	1	0

The charge of fertilisers and manures is spread over a period of years in the following proportions:—

	1st Year per cent.	2nd Year per cent.	3rd Year per cent.	4th Year per cent.
Artificial fertilisers	70	30	—	—
Farm manure	50	25	$12\frac{1}{2}$	$12\frac{1}{2}$
Green manure	50	35	15	—

Preliminary Trials with Winter Crops on Wet Vlei Lands without Irrigation,

AT THE GOVERNMENT TOBACCO EXPERIMENT STATION.

By the DIVISION OF THE CHIEF AGRICULTURIST.

In the accompanying tables are given the acre yields obtained from various cereal crops on the sandy, wet vlei land at the Government Tobacco Experiment Station near Salisbury, during the winter season of 1929. These results cannot be taken as conclusive evidence of the comparative merits of the respective fertiliser dressings used on the various plots, but it is thought that the figures may prove of interest and use to farmers who are utilising their wet vlei lands for the production of green winter feed for sale, or consumption on the farm.

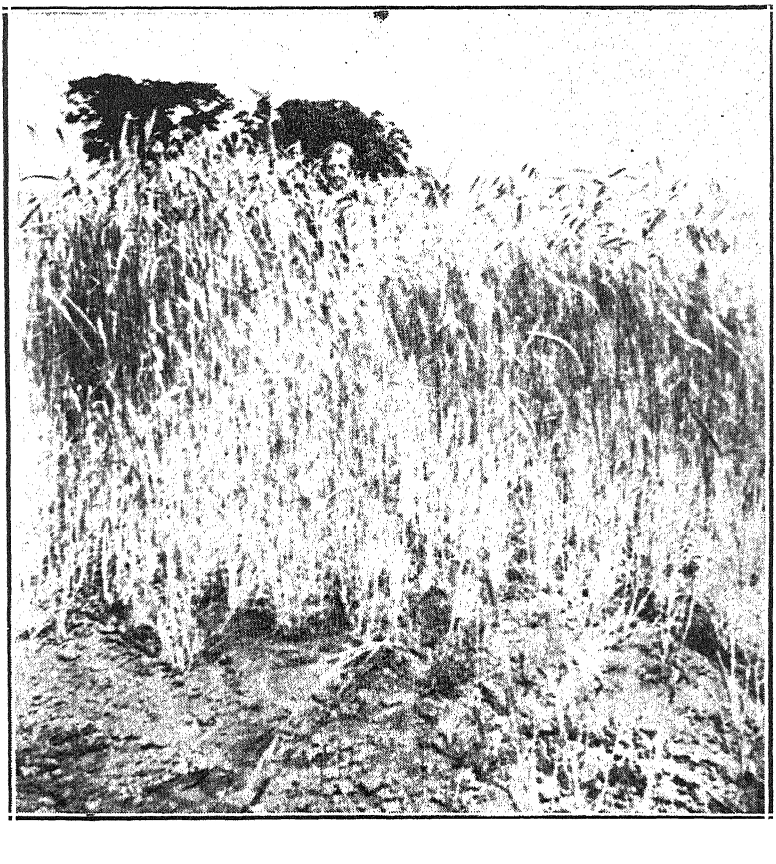
The soil on which these experiments are being conducted is not of high fertility, and may be looked on as being fairly representative of the average sandy vleis of this Colony. The inherent fertility of the plots varies greatly, as does the moisture-retaining power of the soil. It will be necessary to continue the fertiliser trials over a considerable period of years before conclusive results can be obtained.

It was the intention last winter to sow the whole vlei to rye, with a view to obtaining information concerning the variations in fertility of the land, but, unfortunately, owing to the non-delivery of seed, this was impossible, and thus the scheme of experiments had to be changed.

Very little is known concerning the response of cereal crops on the wet, sandy vlei soils of this Colony to applications of fertilisers, and for this reason, despite the unavoidable lack of definite accuracy in these trials, it is thought that the attention of farmers may be drawn to the results obtained on plots 9 and 10, table No. 2, and plots 14 and 16, table No. 1.

It will be seen that a dressing of 200 lbs. of potassic superphosphate on rye has given an increase of 62 per cent. in the yield of grain, in comparison with a dressing of the same weight of superphosphate. The difference between these adjacent plots was very marked all through the growing

Kinvarra Oats, Tobacco Experiment Station, Salisbury. Planted 2nd May, 1929. Yield per acre, 495 lbs. of grain and 2.32 tons of green forage.



period, and can only be attributed to the potash contained in the potassic super. Although the use of potassic fertiliser in conjunction with phosphatic fertiliser cannot be unreservedly recommended on such slender evidence, it is considered that the results obtained in this experiment are of sufficient significance to justify farmers in carrying out experiments with light dressings of potassic fertiliser on a small scale on similar soils on their own farms. For those who wish to investigate this point for themselves, a dressing of 150 lbs. of superphosphate and 50 lbs. of muriate of potash per acre should be suitable.

Throughout the range of these preliminary trials it was noted that the dressings of phosphatic fertiliser appreciably hastened maturity of the crops, particularly in the case of the superphosphate. This is a well-known effect of quick acting phosphatic fertilisers on summer dry land crops, and is confirmed here with reference to wet vlei lands.

The value of rolling the seed bed in bringing up moisture to the surface to assist germination was admirably demonstrated on plots 1 to 4. On these plots, the upper four to five inches of soil were quite dry at the time of sowing the rye, and it is very doubtful whether germination would have taken place without the rolling (with a Cambridge roller), which was carried out immediately after the discing in of the seed. This brought the moisture to the surface almost immediately, and a good germination was secured.

The spike-harrowing given to these cereals when the crops were about 3 ins. high was noted to give beneficial results in stimulating the growth and tillering of the various crops, as is normally known to be the case with cereals grown under dry land conditions.

The power of rye to produce excellent yields of both green fodder and grain on soil which was too low in fertility and with too poor a water supply to produce paying yields of the other cereals was once again clearly demonstrated. Oats and wheat, grown on the same soil, gave extremely poor, uneconomic returns. Wheat yielded only 160 lbs. of grain per acre, and oats gave a negligible return, whereas rye gave a yield varying from 410 lbs. to 1,280 lbs. of grain per acre. This wide variation in the yield of the rye was largely due to the variations in the water supply in the soil and sub-soil, and, to some extent, to the variation in the inherent fertility of the land.

Reference to tables 1 and 3 will show that yields of green forage were obtained of over $3\frac{1}{2}$ tons in the case of rye, and of $2\frac{3}{4}$ tons in the case of oats. With such yields, one acre of oats or rye should supply 10 to 12 dairy cows with an ample ration of green feed for 10-14 days. A fertile vlei soil, with a moderate dressing of farm manure, might give double these yields of green oats and rye.

The green rye when cut up with a chaff cutter was readily eaten by dairy cattle, and this is a crop of which greater use might well be made for this purpose, since, as shown, it will give excellent yields of green fodder on soils which are too poor to give an economic return of oats or barley.

When rye and oats are grown for green feed during the winter on similar wet vlei lands, successive sowings may be made at intervals of about two to three weeks from the first sowing made towards the end of February or beginning of March, so as to ensure a regular supply of green food during the dry months of the year, after sweet potato tops and other green feed have been consumed.

CAPE EARLY RYE.

Table No. 1.

Yields of Green Fodder.

Cut 31st August, 1929.

Plot	Manurial Treatment in Lbs. per Acre	Date Sown	Yield per Acre of Green Fodder. Tons.	Remarks
1	200 lbs. Superphosphate ... 50 lbs. Nitrate of Soda ...	2/5/29	3·02	These results cannot be considered as significant owing to the great variation in the moisture retaining power of the soil of these plots.
2	200 lbs. Superphosphate ...	2/5/29	2·24	
3	200 lbs. Bone and Superphosphate 50 lbs. Nitrate of Soda ...	2/5/29	2	
4	200 lbs. Bone and Superphosphate	2/5/29	1·66	
8	200 lbs. Superphosphate ...	18/5/29	3·56	Heavier vlei soil than plots 1 to 4.
10	No Fertiliser	18/5/29	3·19	
12	200 lbs. Double Complete Tobacco Fertiliser	18/5/29	3·44	
14	200 lbs. Potassic Superphosphate	7/6/29	3·38	Planted in June
16	200 lbs. Superphosphate ...	7/6/29	2·99	

CAPE EARLY RYE.

TABLE No. 2.

Yields of Grain and Straw.

Reaped 26th September, 1929.

Dates of Sowing:

Plots 1—4 ... ... 2/5/29.
Plots 5—6 ... ... 18/5/29.
Plots 7—8 ... ... 13/5/29.
Plots 9—10 ... ... 7/6/29.

Plot	Manurial Treatment per Acre	Grain per Acre. Lbs.	Straw per Acre. Lbs.	Remarks
1	200 lbs. Bone and Superphosphate 50 lbs. Nitrate of Soda ...	1,280	4,360	Very light grey sandy soil. Hardly enough moisture to germinate seed at time of sowing.
2	200 lbs. Bone and Superphosphate	1,030	3,880	
3	200 lbs. Superphosphate ... 50 lbs. Nitrate of Soda ...	700	2,490	
4	200 lbs. Superphosphate ...	410	1,280	
5	200 lbs. Double Complete Tobacco Fertiliser (20/7/10) ...	1,200	3,008	Heavier, blackish vlei soil.
6	None	930	2,736	
7	200 lbs. Superphosphate ...	565	...	...
8	None	500	...	...
9	200 lbs. Potassic Superphosphate ...	650	...	Plots 9 and 10 planted 7th of June.
10	200 lbs. Superphosphate ...	400	...	

N.B.—All fertilisers were applied broadcast at the time of sowing.

OATS.

TABLE No. 3.

Yields of Green Forage.

Date sown ... ... 2/5/29.
Date cut ... ... 29/9/29.

Variety	Manurial Treatment	Yield per Acre Green Forage	Remarks
Algerian ...	None ...	2·76 tons	Poorly grown crop; soil dried out too rapidly.
Kinvarra ...	None ...	2·32 tons	Rather dry when cut

OATS, KINVARRA.

TABLE No. 4.

Yields of Grain and Straw.

Date sown ... ... 1/5/29.

Date reaped ... ... 25/9/29.

Plot	Manurial Treatment	Straw per Acre Lbs.	Grain per Acre Lbs.
1	None ...	1,758	495
2	None ...	1,398	467½
Average Yields of Two Plots ...		1,578	481

WHEAT.

TABLE No. 5.

Planted ... ... 2/5/29.

Reaped ... ... 23/9/29.

Plot	Variety	Manurial Treatment per Acre	Grain per Acre Lbs.	Straw per Acre Lbs.
1	Quality ...	200 lbs. Bone and Superphosphate	310	640
2	,, ...	200 lbs. Superphosphate ...	380	628
3	,, ...	None	140	...
4	Union No. 17	200 lbs. Superphosphate ...	416	646
5	,, ...	200 lbs. Bone and Superphosphate	552	744

The poor yields are due to the low fertility and the rawness of the soil. In the coming winter these trials with wheat will be continued on land which has received a moderate dressing of farm manure.

Talks to Poultry Keepers.

PREPARE FOR THE BREEDING SEASON.

By the POULTRY BRANCH, DEPARTMENT OF AGRICULTURE.

Every poultry keeper naturally hopes for a good hatching season and numbers of strong well-grown lusty chicks; this can only be accomplished by having breeding stock of the best quality possible, and in the best of health and condition.

The Housing.—This must be comfortable, airy, without draughts, scrupulously clean and convenient. A house 6 ft. x 6 ft. is sufficient for a breeding pen up to 12 hens and a male bird; it must not be too hot nor too cold, but of as even a temperature as possible, and above all it must not be damp.

The food must be of good quality and plain. There must be no forcing with too much meat food, and, above all, condiments of any sort spell failure, *i.e.*, poor hatches and weak stock. Grain well buried in the litter should be the main item; only a little, if any, dry mash; plenty of green succulent food and thick separated milk will keep the birds in good health and condition.

Selection of the Birds.—This must be very carefully carried out, and the sooner the better. The main points are:—Birds of standard size, type and colour and good layers of large eggs. There is an inclination at the present time in other countries (it is gratifying to know that it does not equally apply to Rhodesia) to choose breeders for their laying qualities only, and little or no attention is paid to type, size, colour, size of egg or constitution. Only the very best, in every way, should be selected as breeders. No bird, for instance, which lays an egg under 2 ozs. should be put

in the breeding pen; in fact, we recommend birds laying 2¼ oz. eggs; these will produce pullets, if properly reared, which will lay (when they have got into their full lay) nothing under 2 ozs., but if only 2 oz. eggers are used, many of the progeny will lay under 2 ozs.

Number of Females to One Male.—This is a question often asked. Given the qualities necessary in the breeders, then the amount of scratching exercise the birds are made to take and the size of the run have a great bearing on the matter. A light breed male can be given more hens than a heavy breed one by three or four under similar conditions. For instance, in a run 6 ft. x 30 ft. six to eight hens of a heavy breed are sufficient for one male; given a run double the size, ten to twelve females can be given, and so on. If on absolutely free range, twenty heavy breed birds to one male, and thirty to thirty-five light breed birds, are not too many. We have run fifty-two Leghorns with one male on free range and nearly every egg has been fertile. Of course the birds must be in good hard condition and with no superfluous fat. Breeding stock on free range, if it is possible to arrange, produce, there is no doubt, better hatching and better chicks than if in confinement, but it is often difficult to do this, especially if several breeding pens are being used.

Treatment of the Breeding Stock before being Mated.—This is almost the most important factor in the production of good stock. The birds selected must be given, if possible, free range; heavy laying must not be encouraged. To put birds into the breeding pen that have been laying heavily for some time is to court disaster in poor hatching and weak chicks. The system generally and the reproductive organs must be in the best of condition, for heavy laying is a big strain on these. The resultant germs, embryos and later developed chicks are naturally weak. Too often we find poultry breeders putting birds that have just come off a laying test, or which have just finished their pullet year of laying with high records, into the breeding pen, and then being disappointed with the results, wondering why there has been a poor hatch and the progeny not up to the quality of their dams. The reason is obvious; after months of heavy laying, can one possibly expect the vitality and organs to be in a condition to produce strong, healthy progeny?

It stands to reason they cannot. Two or three months, therefore, of recuperation on free range, with a rest and a more or less cessation of laying, are absolutely necessary. Never breed from birds that are in the moult or just over it; this again is a big strain on the system and organs. They should be well over the moult and have at least a month's rest before going into the breeding pen.

These are points the poultry keeper often misses and the result is a poor hatching and rearing season. It is infinitely preferable to have half the number of breeding stock that are in the best of condition than double the number that are not. Poor breeding stock means waste of time, labour and money, and no improvement; good breeding stock means the reverse.

Bulletins on "Choosing a Male Bird," "The Breeding Stock," "Mating for Improvement," are available, post free, on application to the Poultry Expert, Department of Agriculture, Salisbury.

Regulations Governing the Export of Maize and Maize Meal through the Port of Beira.

The following are the revised regulations recently promulgated by the Government of Mozambique Territory under Ordinance No. 6043:—

SECTION 1.

Maize from the Territory of the Companhia de Mozambique.

Article 1.—No maize destined for export to any point outside the Territory of the Companhia de Mozambique shall be accepted for despatch at the Customs unless accompanied by a grade certificate issued by the Director of Agriculture, in conformity with the present regulations.

Article 2.—The grading shall be done in accordance with the following schedule, in which the same standards have been adopted as those established by the Union of South Africa:—

Grade mark to be shown on bags.	Class and grade.	Description.
1	Flat White 1	To be sound, dry, plump and well cleaned, with a maximum of 1 per cent. of yellow, discoloured or defective grain.
2	Flat White 2	To be sound, dry and reasonably clean, and contain not more than 8 per cent. of defective or other coloured grain. Berries may be of irregular size.

Grade mark to be shown on bags.	Class and grade.	Description.
3	Flat White 3	To be sound, dry and reasonably clean, and contain not more than 13 per cent. of defective or other coloured grain. Berries may be of irregular size and shape.
7	Mixed	To be sound, dry and reasonably clean, and contain not more than 10 per cent. of defective grain.
8	No grade	To include all maize which cannot be classed in a higher grade, but to be in a dry condition, fit for shipment, and contain not more than 40 per cent. of defective grain.

Article 3.—Grain found to be unripe or musty will not, on any account, be permitted to be exported.

Article 4.—No maize shall be permitted to be exported which contains more than the following percentages of moisture:—

For export overseas ... ... 12.5 per cent.
For export by land ... ... 14.0 ,,

Paragraph 1.—Maize containing an excess of moisture, which has been dried artificially to the satisfaction of the official grader, shall be re-graded and exported under a grade certificate, in which will be inserted, in the space reserved for remarks, the description "Wet maize dried to the satisfaction of the grader.".

Paragraph 2.—Maize exported by land which contains more than 12.5 per cent. moisture, but within the limit as fixed by this article, must have this percentage indicated in the respective certificate.

Article 5.—The export of weevily or slightly weevily maize will only be permitted under Government supervision on the production of a declaration, signed by the agents of the shipping companies, that such maize will not be carried in the same hold as sound maize.

Article 6.—All certificates will be issued on white paper printed in black ink.

Paragraph 1.—When the maize is attacked by weevil, the same certificate will be used, but in the column reserved for "Remarks" will be inserted, by means of a stamp or in writing, the phrase "Slightly weevily" when the proportion of damaged grain is equal to or less than 10 per cent., or "Weevily" when this percentage is exceeded, with a maximum of 40 per cent.

Note.—*Damaged grain shall mean grain which is actually damaged by or holed by weevil.*

Paragraph 2.—"Weevily" or "Slightly weevily maize" which has been treated by the cleaning and drying plant shall be re-graded and exported under a grade certificate, which shall have inscribed in the space reserved for "Remarks," "Weevily maize (or slightly weevily maize) cleaned to the satisfaction of the grader."

Article 7.—All maize from the Territory of the Companhia de Mozambique destined for export by sea shall be graded at the port of Beira.

Article 8.—All maize from the Territory of the Companhia de Mozambique destined for export by land shall also be graded, but this may be done at any place within the Territory.

Article 9.—The export by river shall be considered subject to the dispositions of Articles 7 and 8 in accordance with the route which may be subsequently utilised, and taking into consideration the destination of the maize.

SECTION 2.

Maize Meal from the Territory of the Companhia de Mozambique.

Article 10.—No maize meal shall be accepted for despatch at the Customs unless accompanied by a grade certificate

issued by the Director of Agriculture, in conformity with the present regulations.

Article 11.—Certificates of grade shall be issued in conformity with the following schedule, which is based on the standards adopted by the Union of South Africa.

Grade mark to be shown on bags.	Class.	Description.
M 1	White maize flour	To be milled from maize of Grades 1 and 2, described in the present regulations.
M 2	Granulated white maize meal	Without husk or germ, milled from Grades 1 and 2, described in the present regulations, and passed over a sieve 16 mesh to the square inch.
M 3	White maize meal	To be milled from maize of Grades 1, 2 or 3, described in the present regulations, and passed over a sieve 18 to 32 mesh to the square inch.
M 5	Mixed maize meal	To be milled from maize of Grades 1, 2, 3 or 7, described in the present regulations, and passed over a sieve 18 to 32 mesh to the square inch.

Article 12.—No maize meal shall be permitted to be exported which is found, on inspection, to be sour, containing excessive moisture, caked or injured by weevil or other insect.

Paragraph 1.—The maximum limit of moisture content in maize meal shall be:—

For export by sea ... ... 12.5 per cent.
For export by land ... ... 14.0 ,,

Paragraph 2.—Maize meal for export by land which contains a higher moisture content than 12.5 per cent. must have the actual percentage indicated in the respective certificate.

Article 13.—No maize meal shall be permitted to be exported which has a higher temperature than 17.25° Centigrade (63° Fahrenheit).

Article 14.—No maize meal shall be permitted to be exported which is found on inspection to have been milled from unripe, musty, fermented or weevily maize, or containing a higher percentage of impurities than those permitted in the respective grades of maize.

Article 15.—Articles 9, 10 and 11 of Section 1 referring to maize are applicable to maize meal for export.

SECTION 3.

Maize and Maize Meal from Southern Rhodesia.

Article 16.—All maize and maize meal of Southern Rhodesia origin, in transit to the port of Beira for export, shall be subject to the rules established in the preceding articles, with the following exceptions:—

1. All consignments must be accompanied by a grade certificate issued by the competent Department of the Southern Rhodesia Government.

2. The above-mentioned consignments shall be subject to examination by the Official Grader of Grain of the Department of Agriculture of the Companhia de Mozambique, who will issue the necessary certificate, in terms of Article 1 of these regulations, printed in red ink on white paper.

3. The original Southern Rhodesia certificates referred to in No. 1 of this article will be returned to the exporters after the maize to which they refer has been shipped or rejected, and a weekly return will be sent to the Southern Rhodesia Government, in which will be registered the result of the examination of the maize or maize meal to which these certificates refer.

SECTION 4.

General Dispositions.

Article 17.—All sacks of maize meal, whether from the Territory of the Companhia de Mozambique or Southern Rhodesia, destined for export shall be examined before the respective certificate is issued.

Article 18.—Maize and maize meal can only be accepted for examination when contained in sacks which satisfy the following conditions:—

(a) They shall be new twill sacks, with a gross weight of 92 kilos (203 lbs.), sewn with at least 5-ply double twine and with stitches 2.5 centimetres (1 inch) apart.

(b) They shall be "A" quality, weighing 1.125 kilos (2½ lbs.), 8 x 8 (8 porter, 8 shot).

Paragraph 1.—When applied to maize meal, Grades M 3 and M 5, the gross weight may not be less than 88.2 kilos (196 lbs.), but second-hand bags of good quality may be used.

Article 19.—The Director of Agriculture shall delegate to the Chief Grader of Grain the functions which are judged convenient, and he may issue or refuse the certificates referred to in the present regulations at his own discretion.

Article 20.—The Chief Grader of Grain may delegate to the permanent assistant graders the issuing of provisional certificates for up-line grading.

Paragraph 1.—During the period of heaviest export by sea, provisional certificates may be issued in the interior of the Territory by temporary assistant graders.

Article 21.—In the event of interested parties not agreeing to the result of the grading, they have the right of appeal to His Excellency the Governor of the Territory.

Article 22.—No grade certificate for maize or maize meal destined for shipment will be issued until the bill of lading covering the shipment is presented.

Article 23.—The charge for grading shall be 1 centavo (gold) per bag of maize or maize meal.

Article 24.—For the cleaning or drying of maize by the cleaning and drying plant of the Department of Agriculture the amount of 10 centavos shall be paid for each bag.

Paragraph 1.—Maize for artificial drying and cleaning will be accepted in accordance with the capacity of the plant and in priority of written application. Weevily maize can only be dealt with during the latter part of the export season.

Article 25.—In recognised cases of urgency the Chief Grader of Grain shall grant the written request of any interested party who desires that grading should be done outside regulation hours. In such cases an amount shall be charged equal to that which the Companhia de Mozambique has to pay to the staff engaged thereon, as overtime, in terms of Article 52 of the Employees' Regulations.

Article 26.—In dealing with export from Rhodesia, or that which is destined for countries where the English language is spoken, it is permitted to insert in the certificates the translation of the expressions in the Portuguese language adopted in the present regulations.

Article 27.—Notwithstanding that all possible care will be taken in grading, the Companhia de Mozambique does not assume any responsibility by the issuing of grade certificates.

Article 28.—The present regulations shall come into force on the 1st March of 1930 and revoke all dispositions to the contrary.

The following is the English translation of the port maize export certificate, which, however, actually is printed in the two languages line by line. The lettering in the certificate to be used for Rhodesian maize is printed in red ink on white paper, whereas the certificate for maize grown in Mozambique Territory is printed in black ink.

Government of the Territory of the Mozambique Company.

DEPARTMENT OF AGRICULTURE.

Office of the Chief Grain Grader,

Beira,..............................

Export of Southern Rhodesia Maize.

Grain Certificate.

I certify that the grain described hereunder is the product of Southern Rhodesia and has been duly examined by me and found to be in sound condition and equal to the standard herein set forth, in accordance with the maize export regulations of the Government of the Territory of the Mozambique Company and of the Government of Southern Rhodesia.

Shipment per S.S..

Consigned to port of..

Consignor...

Consignee...

Number of bags....................and/or tons.....................

Condition of bags...

Shipping marks..

Class and grade...

Grade mark shown on bags..................and grade............

Year of harvest...

Remarks...

This certificate is issued by the Government of the Territory of the Mozambique Company in agreement with the Government of Southern Rhodesia, without involving any responsibility whatsoever on the part of the said Governments.

....

The Chief Grain Grader.

Some Aspects of Cost of Production Studies in Agriculture.

(A Paper read before the British Association in Pretoria.)

By Arthur G. Ruston, D.Sc., Department of Agriculture, Leeds University.

One frequently hears it stated that farmers as a class do not keep books. As far as my observations go it would appear to me that most farmers do keep books, possibly of a sort, but that very few make use of them when kept. When once the books have been closed, the accounts balanced, checked, proved and audited, we have reached not the end, but the beginning of our labour, for it is in the critical examination of the records which the books provide that their value lies, and unless the books can be made to talk it is almost a waste of time keeping them.

What is required on the ordinary farm is some simple and none too complicated system, which will give to the individual farmer the maximum amount of information with regard to his farm management with the minimum amount of trouble to himself.

A full "costings system" possibly is the ideal; it should certainly give the maximum amount of information. But a "costings system" takes time, often more time than the ordinary working farmer has at his disposal, with the result that it is frequently none too popular; and the point that is now being considered in Great Britain, as in other countries, is to what extent it can be replaced by other and more simple methods.

In our work in Yorkshire, on starting our investigations some fourteen years ago we adopted at first full and detailed "costings methods," which of necessity restricted our economic studies to only a small and limited number of farms. Later, a modified "costings system" was introduced, moulded to a large extent on Danish lines worked out by Dr. Larsen, which took less time and enabled us to widen our outlook. More recently we found it possible to extract a large amount of information from a study of purely financial accounts, such as might be drawn up for income tax purposes; infor-

mation which enables us quickly to lay our fingers on the weak spots in the management of the individual farms and make definite and concrete suggestions for remedying them.

Survey of the East Riding.—Geographically the Riding may be divided into three types:—

I. The Uplands, which consist of the chalk Wolds, sweeping in a broad belt from Flamborough Head to Hessle and Ferriby, and rising to a height of from 600 to 800 feet above sea level.

II. The low-lying boulder clay soils of Holderness, which lie to the east of the Wolds and extend right down to the sea coast as far as Spurn Point.

III. West of the Wolds runs a narrow strip of jurassic rock, separating them from the alluvial flats, many of them light sand, others natural or artificial warp.

Cropping.—The variation in the cropping and crop disposal in the three areas was interesting and instructive.

Cropping in East Riding.

	Chalk Wolds.	Holderness clay.	Light or warp land.
Grass—	Per cent.	Per cent.	Per cent.
Pasture	16.2	24.1	23.8
Meadow	0.7	4.6	4.3
Arable—			
Seeds, grazed ...	17.1	13.2	6.8
„ mown ...	3.6	...	4.9
Wheat	13.2	16.8	12.1
Barley	15.0	6.0	3.4
Oats	13.7	11.7	12.2
Rye	...	...	1.8
Beans and peas ...	...	0.3	0.9
Potatoes	...	0.5	11.6
Carrots	...	...	2.6
Sugar beet ...	0.7	0.8	3.4
Roots	19.8	12.9	10.1
Mustard	...	...	1.1
Bare fallow ...	...	9.1	1.0
	100.0	100.0	100.0

On the Wold farms surveyed, roughly 17 per cent. of the cultivated area is under grass and 83 per cent. under the plough; apparently the arable land is being worked almost entirely on a five-course rotation, with barley as the principal white crop and the root break occupying the largest area of the land under the plough. With the single exception of the cereals, no sale crops are being grown, and the arable land is being utilised mainly in growing crops for consumption by the stock on the farm. If the stock are a paying proposition, well and good, but if they are of a type which may not be expected to leave much money, then the consequences may and actually do become serious.

On the heavy Holderness clay, with the single exception of wheat, very few crops are being grown for direct sale off the farm. There are also indications that more than 50 per cent. of the wheat is being grown after bare fallow, with the probable result that on three-horse land of this description the acreage costs of growing its one sales crop must be abnormally high.

On the light or warp land west of the Wolds there is apparently no hide-bound regularity in the rotation; here the farm is not being run for the sake of the rotation, but the rotation adapted to the needs of the individual farm. There are evident signs that the men here are specialising not only in sale crops, but in sale crops which are to a certain extent safeguarded naturally by their bulk, like potatoes and carrots; by their perishability, like peas, for picking green; or artificially by Government action, as in the case of sugar beet. From the nature of the cropping of the light, warp potato or carrot land one would naturally expect the arable men in this area to be suffering less from the general agricultural depression than their confreres either on the chalk Wolds or the Holderness clay.

This supposition is strengthened by a study of the estimated output or production of the farms in the different areas.

Output per 100 Acres.

	Six years' records.				
	All Yorkshire.			East Riding.	
	All farms.	Most successful farms.	Wolds.	Holder-ness.	Sand and warp.
	£	£	£	£	£
Dairy products ...	171	615	42	96	53
Beef	109	81	98	98	171
Mutton and wool ...	103	74	233	122	109
Pork	93	116	60	86	98
Eggs and poultry ...	25	56	22	20	51
Stock products ...	501	942	455	422	482
Wheat	51	53	75	115	121
Oats	18	32	20	7	48
Barley	35	84	123	9	11
Beans and peas ...	5	18	...	2	8
Potatoes ...	123	213	...	4	275
Carrots	2	13	...	...	108
Beet	1	8	2	6	61
Other crops ...	44	37	7	16	153
Crop products ...	279	458	227	159	786
Stock ,, ...	501	942	455	422	482
Total output ...	780	1,400	682	581	1,267

It is interesting to find that notwithstanding the fact that in this arable area they are specialising in the production of crops for direct sale rather than for consumption by stock on the farm, the output of stock products is actually higher on the acreage basis than it is on the Wolds or in the

Holderness area. The evidence available goes to show that on the Wold and Holderness farms things are going round too much in a vicious circle, but that the circle is short-circuited with advantage on the sand and warp holdings.

Evidently the outstanding feature at the present time, both as regards the Wold and Holderness farming, is the fact that on arable land of this description so small a total amount of agricultural products is actually put upon the market. Before, however, any constructive criticism can be offered or definite suggestions made to individual farmers in these areas with the object of remedying this state of things, it would certainly be advisable to obtain fuller and more detailed information than can be obtained from a preliminary survey of the kind that was made last year.

Financial Accounts.—A study of the purely financial accounts as might be drawn up by any accountant for income tax purposes brings out a large number of points of more than general interest.

Thus, during a period of eight years, in our own county of Yorkshire, the records of approximately 100 farms show that there has been produced for sale each year on every 100 acres of cultivated land agricultural products to the value of £780, and that during this period these holdings as a whole have failed to hold their own.

These results further show that each year very varying financial results have been obtained from the different individual farms, varying from a loss of 56 per cent. to a profit of 58 per cent. on the working capital invested in the holding, or from a loss of £10 to a profit of £10 per acre of land under cultivation.

If, however, we examine the records, not of all the farms good, bad and indifferent, but of those which have proved financially successful, giving an annual net return of at least 15 per cent. of the working capital, we find that these farms have produced for sale agricultural products to the value not of £780, but of £1,400 per 100 acres, suggesting that even in these days of agricultural depression high production is still the first essential of success.

A further study of the records of these successful farms brings out the fact that the output or production is high,

both as regards stock and crop products. The successful farmer apparently does not put all his eggs into one basket; he does not put his entire trust upon stock, nor yet upon crops, but pins his faith upon a blend of the two. He makes his stock stand upon its own bottom, makes it add to the fertility of the soil, and cashes some of that fertility in the form of sale crops. A more detailed study of the output or production from these successful farms suggests that these men, as far as stock are concerned, are concentrating on milk rather than on beef production, and peculiarly enough, paying much more attention to pigs and poultry than to sheep, the gilt-edged security of the farm.

If, however, we look at the other side of the picture, not at the output or production, but at the production costs, it will be seen that in these days, when we are hearing all too frequently that the solution to the problems of depressed agriculture must be solved along the lines of retrenchment and cutting down of expenses, the really successful men are actually spending more on the acreage basis than their less successful brothers. It is not production; it is not production costs that really matter, but the margin between the two. If the most is to be got out of the land, an equivalent of what is taken out must be returned to it in the form of labour and raw materials.

The lowest rented farm is not necessarily the cheapest. It is false economy to cut down the labour bill too drastically, to under-feed the stock, to fail to return to the holding the fertilising ingredients removed by stock or crop products sold off the farm.

A further study of the records of these successful farms would suggest that financial success is to be found most readily—

(a) on farms not too large and not too small; and that in Yorkshire at all events there are two peaks in the curve of economic efficiency as far as size is concerned, one approximating to 150 acres and the other to 300, and that there is a marked drop in the economic efficiency of the holding when its size falls below 35 acres or rises above 1,000 acres; it is certainly not without significance that during

the 14 years of our investigations we have never yet been able to include in our list of really successful farms any holding less than 50 or greater than 500 acres;

(b) on land light in texture rather than on heavy clay;

(c) not on purely arable, not on purely grass land, but on farms where the grass and arable are blended roughly in the proportion of three to two;

(d) in those districts where markets and marketing facilities are good, and on those farms where the most is made of the marketing facilities available.

Cost Accounts.—While, however, points of more or less general interest can be noted and case after case could be quoted in which a study of the purely financial accounts as drawn up for income tax purposes has revealed faults in management, alterations in which would be to the financial benefit of the farm, it is only when some modified or complete system of cost accounts is being kept that the fullest use can be made of the books as an aid to farm management.

Farm A is one of roughly 300 acres, of which only 20 are under the plough. Walk over the farm and you will find the grass land improved during the last five years almost out of all recognition. You will find on it some of the best stock in the country, you will find the buildings papered with cards showing that the highest possible honours have been won in the show yards of England and Scotland; yet the financial accounts afford sorry reading, showing that annual losses of approximately £2,000 have been made. There is no need of any "detailed costings system" to tell this man that there is something very radically wrong with his methods of farm management from the business point of view, for if the land had been given to him rent free, his men had worked for him free, gratis and for nothing, for no wage but simply for the pleasure of working; if the various tradesmen had receipted his bills and not asked for payment; if the manure merchant had supplied the manures without charge, simply for the sake of advertisement; and the cake merchants had asked him to pay for 9 cwts. only out of every ton of cake supplied, the farm would still have failed to hold its own. A study of the financial accounts alone will tell him that

on the side of his production costs there is really little to complain of, but that what is wrong is the fact that its output or production is infinitesimally small—practically at the zero point. Here indeed is a case in which the ordinary financial records can be made to give practically all the necessary view points of the farm, and cost accounts here would be merely a waste of valuable time and little more than a work of supererogation.

Farm B is one of approximately 300 acres, half grass and half arable, the financial accounts of which bring out again quite strongly the glaring faults in its management. Here high output or production, the first essential of success, has been obtained, but the high output has been killed by high production costs, particularly as far as labour is concerned. With a tendency to let philanthropy occasionally over-ride business principles, the farm is carrying far too many pensioners, and high rates of wages are being paid for relatively inefficient labour, with the result that while on the normal farm the wage bill absorbs 28 per cent. and on the more successful farm it absorbs 20 per cent. of the total output, on this farm it absorbs no less than 46 per cent. Unfortunately on a holding of this description, where the men are undoubtedly overpaid, the need for economy which is not emphasised in the one direction by the farmer himself is overlooked by the men in other directions, and expenditure mounts up on all sides out of all proportion to the return obtained. In spite of the fact that on this holding, half grass and half arable, practically the whole of the crops are grown for consumption on the farm, no less than £6 an acre is being spent, mainly in the form of foodstuffs for the stock, while the tradesmen's bills and other non-productive expenditure mount up to more than 45s. per acre. Other points of criticism could be raised with reference to the management of the farm; the methods of cropping and crop disposal need re-adjustment, more care is needed in the rationing of the stock, but one must see the labour on the farm utilised to better advantage if the holding is to be carried on as a successful commercial venture; and until these outstanding faults have been corrected I see no use in wasting time and energy in setting up an elaborate and detailed costings scheme on the farm.

Farm C is one of 75 acres, the high output of which on the acreage basis is again killed to a large extent by heavy expenditure—in this case particularly in the outlay of raw materials on the purchase of foodstuffs for stock. Here it is quite evident from the financial accounts alone that the lack of rationing, the indiscriminate feeding and the doing of the stock too well have been the main causes of the comparatively low net financial return, notwithstanding the high production on the farm. This point can, however, be brought more strongly to the notice of the farmer concerned when a "costings system" reveals the facts that 94 pork pigs got off at approximately six months old have consumed on the average 16 cwts. of concentrated foods per head, the equivalent of 9 lbs. per head per day while on the farm, and that he has spent no less than £404 on the food bill alone in producing pork to the monetary value of £460, giving a ratio in the cost of food to the monetary value of pork produced of 100: 114. Such a man is much more likely to make the necessary alterations when his books reveal to him not only that he is over-feeding, but that he is over-feeding with a badly balanced ration, and that as a result of his management, or lack of management, in the feeding of his pigs his profits per breeding sow—in a year when pork prices were high and his sows dropping quite good litters, dropping and rearing an average of 15 piglets per breeding sow during the year—amounted only to £8 per head. He will be all the more likely to make use of the information made available through a study of his own books when he is taken to a neighbouring farm and sees that the care given to the balancing and adjustment of the rations fed has resulted in a profit not of £8, but of £17 10s. per breeding sow; and that another man, possessing, as he thinks, no greater degree of intelligence than himself, has been able, from an outlay of £100 on foodstuffs, to produce pork to the value not of £114, but of £133. In this case the broad financial records revealed the weak spot in the farm management, but a more detailed analysis of the accounts was required to point a sure way to its rectification.

Farm D is one of 181 acres, roughly one-third grass and two-thirds arable, which, when we first got in touch with it, was losing money. During the last four years it has shown a total average net profit of £794 a year, or of 32 per cent.

of the working capital invested in the holding. On this farm the monetary value of the output has been increased by 62 per cent. in a period during which prices on the whole have been falling. In spite of the fact that the selling price of milk on this farm has fallen from an average of 2s. 1d. to 1s. 3d. per gallon, the total receipts from the sale of milk have increased by 66 per cent., and in spite of the drop in the prices of mutton, pork and poultry products, the monetary value of their output has increased by 106 per cent. The increase in the output of stock products has been obtained without any sacrifice of the crops grown for direct sale off the farm; actually the increased stock-carrying capacity of the farm has coincided with an increase in the output of crop products; and on this farm, typically barley land, with the selling price of barley falling from £4 to 36s. per quarter, the total receipts from crops sold directly off the land have increased from £486 to £779. While, however, the output or production has been rising, production costs have fallen by no less than 20 per cent. All this has meant drastic re-organisation, alterations in the methods of cropping and crop disposal, in the treatment of the grass land, in the system of management of and the rationing of the stock, as well as in the disposal of the stock products, and there can be no doubt that the remarkable improvement made in the financial position of this and other farms which might be quoted would scarcely have been possible but for the practical assistance in farm management obtained from a careful study of the books right through. Writing on 29th April, 1929, this man says, "I must thank you once more for all you have done for us, and I am sure that your work in showing each branch of the accounts separately has shown us the remunerative lines and led to our success."

Possibly it may be said, and said with a good deal of truth, that a detailed analysis of farm accounts is of value, mainly, if not entirely, to the individual farmer concerned. Actually we have found that the lessons so learnt may have a very much wider application.

Output or Production per 100 Acres.

Farm.	A.	B.	C.	D.
	£	£	£	£
Dairy produce	...	619	43	520
Beef	15	158	222	...
Mutton and wool	30	166	65	86
Pork	...	439	650	120
Eggs and poultry	20	31	314	30
Cereals	...	...	36	160
Other crops...	20	14	503	262
Total output or production ...	85	1,427	1,783	1,178
Balance being loss	481	274	...	...
	566	1,701	1,783	1,178

Production Costs per 100 Acres.

Farm.	A.	B.	C.	D.
Productive Expenditure—	£	£	£	£
(a) Foodstuffs	150	542	746	264
(b) Fertilisers	4	33	98	64
(c) Seed	3	19	64	27
Non-Productive—				
Depreciation	22	75	43	42
Tradesmen's bills	173	168	109	92
Labour	141	653	350	182
Rent	73	211	141	82
Production costs... ...	566	1,701	1,551	753
Balance being profit ...	...	...	232	425
	566	1,701	1,783	1,178

Markets for Southern Rhodesia Sunflower Seed.

Issued by the Division of the Chief Agriculturist.

For a number of years careful selection work has been in progress at the Agricultural Experiment Station, Salisbury, with the object of improving and fixing the various strains of sunflowers, both white and black, at present being grown in this Colony. Considerable improvement has been made in the acre yield, bushel weight, purity of strain, etc., and a point was reached in this work where it became desirable to obtain more exact information as to the types of sunflower seed required by the overseas buyers in order to direct further selection work along the most profitable lines.

Samples of six of the best strains were forwarded to the office of the High Commissioner for Southern Rhodesia, with the request that they should be submitted to brokers and buyers in the principal markets for sunflower seed in Great Britain, with a view to obtaining information as to which of the six types would best meet the requirements of the overseas trade and which it would therefore best pay the farmers of this country to grow. Below is given a brief description of the six strains which were forwarded:—

Sample No. 1.—Colour of seed, black; type, Small Seeded Russian; weight per bushel, 36 lbs.

Sample No. 2.—Colour of seed, black; type, Medium Large Black Russian; bushel weight, 34 lbs.

Sample No. 3.—Colour of seed, white; type, Small White; bushel weight, 33 lbs.

Sample No. 4.—Colour of seed, white; type, Small White, but grain rather larger and purer in colour than No. 3; bushel weight, 31½ lbs.

Sample No. 5.—Colour of seed, white; type, Medium Large White; shape of seed, variable; bushel weight, 29½ lbs.

Sample No. 6.—Colour of seed, white; type, Large White; bushel weight, 27 lbs.

The valuable report received from the expert consulted by the London Corn Trade Association is published in full below for the information of farmers and exporters interested in this question, together with the report of the Imperial Institute, South Kensington.

Report by the London Corn Trade Association, dated 18.10.29.

"The information we give you now must be read strictly from the point of view of a bird-feeding market, and not for crushing, because for crushing the value is not over £10 10s. to £11 per ton. The bird-feeding trade is, of course, a small one.

"Below you will find a market report:—

Samples Nos. 1 and 2.—Good, even-coloured black seed, rather small. Value, £13 to £14.

Samples Nos. 3 and 4.—Bright-coloured white seed; small. Value, £14 to £15.

Sample No. 5.—Large White. Value, £15 to £16.

Sample No. 6.—Long, thin-grain white seed. Value, £14 to £15.

"These prices are per ton c.i.f. London.

"We would mention that sunflower seed is required here as *large* as possible.

"Your samples Nos. 1 to 4 are small for their kind. No. 5 is the best and most saleable quality of all of your samples. No. 6: the growing of this quality should be discouraged, as the buyers do not like the long, thin seed. They prefer the seed to be plump, and preference would be given to the small, plump seed rather than to this long, thin seed.

"You have another quality in Rhodesia which generally meets with a good demand. We refer to the large, plump, grey or striped seed. That variety, and also the larger white similar to your sample No. 5, are the most sought after and saleable qualities.

"Unfortunately sunflower is a very dragging trade, and the Continent is largely over-stocked with this seed because South Russia has been shipping such heavy quantities of good striped and dark seed, and the cheapness of those qualities has naturally affected the other grades, so that at present sunflower seed, even in the better qualities, is cheaper than it has been for a few years.

"We have had some shipments of very satisfactory white seed from Rhodesia, for which we paid £18 per ton c.i.f. London, but as the new crop of white seed in Hungary is very much cheaper this year than last year, we have had to reduce our values, as we have been buying very fine Hungarian white seed of the new crop at £17 c.i.f. London."

From the point of view of the oil crushing trade the same authority offered the following remarks:—

"It is purely a question of the percentage of oil in the different seeds as to their value. We are having same tested, and will advise you shortly the difference in value, if any.

"We have been selling recently Russian and Danubian sunflower seed on the basis of £10 10s. c.i.f. U.K. This is shipped in bulk, but of course that shipped from Rhodesia will have to come in bags, in which case we should have to sell on net weight.

"For crushing purposes the mills ask us whether we can rely upon regular supplies, as they will not use 50 to 100 tons, but want to buy in parcels of 500 tons.

"For bird-feeding purposes we could obtain occasionally a special price for 50 and 25-ton lots."

Report by the Imperial Institute, South Kensington, London.

"In order to determine the type of seed most suitable for cultivation it was desired to ascertain the quality and relative value of the samples. Information was also requested as to whether white or black seed is preferred by the trade.

"Description.—The samples weighed about 2 to 2½ lbs. each and were numbered and labelled as follows:—

No. 1.—Black, small seeded Russian; bushel weight, 36 lbs.

No. 2.—Black, medium large Black Russian; Station No. 30; bushel weight, 34 lbs.

No. 3.—White, small, short seed, of rather dull colour and spotted; Station No. 6A6; bushel weight, 33 lbs.

No. 4.—White, similar to No. 3, but rather larger and less spotted; Station No. 6D3; bushel weight, 31½ lbs.

No. 5.—White, medium to large, mixed shapes; Station No. 5K; bushel weight, 29½ lbs.

No. 6.—White, large seed, much longer than wide; good colour; Station No. 7D; bushel weight, 27 lbs.

"The seeds were found to have the following general characters:—

Sample.	Weight of 100 seeds. grams.	Dimensions of seeds. Length. mm.	Breadth. mm.	Thickness. mm.	Appearance, etc.
1	9.3	9 to 14 mostly 10	5 to 8	3 to 4	Deep purplish black; glossy. Sound seed; clean and free from dirt.
2	9.4	10 to 15 mostly 12	6 to 8	4 to 5	
3	5.8	8 to 9 mostly 9	4 to 5	3 to 4	Of rather dull appearance; colour pinkish cream, with small brown discolorations and spots on most of the seeds. Seeds clean and sound.
4	6.9	10 to 12 mostly 10	6 to 8	3 to 5	Cream-coloured seeds, with a few brown spots and discolorations. Sound, and cleaner and less spotty than No. 3.
5	9.4	12 to 17 mostly 14	6 to 8	3 to 5	Pale cream, with a few brownish discolorations; almost free from spots. Sound.
6	9.0	14 to 19 mostly 17	6 to 8	4 to 5	Pale cream, with a few brownish discolorations. Clean and sound. Very slightly spotted.

"Results of Examination.—Determinations of the oil and moisture in the seeds and of the acid value of the oil were made, with the following results:—

Sample.	Moisture. Per cent.	Oil (on extraction with light petroleum). On original seeds. Per cent.	Oil (on extraction with light petroleum). Calculated on moisture-free seed. Per cent.	Acid value of the oil.
No. 1	7.6	28.4	30.7	0.8
No. 2	7.7	27.3	29.6	0.9
No. 3	7.2	27.2	29.3	0.8
No. 4	6.6	27.3	29.2	0.8
No. 5	7.6	24.1	26.1	0.6
No. 6	6.9	29.6	31.8	0.5

"The foregoing results show that the six samples all furnished good yields of oil and that the acid value of the oil was in each case satisfactorily low. The oils were of normal appearance. The yield of 29.6 per cent. from sample No. 6 was exceptionally high for sunflower seed."

Commercial Value for Oil-crushing Purposes.

The samples were submitted to a firm of oil seed crushers, who furnished the following observations regarding them:—

> "Assuming the samples to be representative of the bulk, it would appear that types Nos. 1 and 6 stand out as superior to all the others. These are the types, therefore, that would appear to be indicated as best for cultivation so far as this particular investigation goes. These two types would appear to compare favourably with the quality which is usually crushed in Europe, i.e., Russian, and we see no reason why these types of Rhodesian sunflower seed should not command as good a market as the Russian variety. We cannot give you market values, as no business is doing at present, but perhaps that information is not material at the moment.
>
> "It is interesting to note that No. 1 is a black seed and No. 6 a white seed. We do not think that the difference in colour amounts to much in the case of sunflower seed, as the residue after crushing is usually sold in meal form. Other things being equal,

however, we should incline to the opinion that a white seed would be preferable, as a light-coloured meal usually has a better appearance and is generally a better 'mixer' where it is required for blending.

"It goes almost without saying that if it were possible for the Rhodesian growers to offer decorticated seed they would find a much wider market than at present obtains for the entire seed."

Concluding Remarks by Imperial Institute.

"Of the six samples submitted for examination, Nos. 1 and 6 are the best and No. 5 the worst in respect of oil content. Nos. 1 and 6 appear, therefore, to be the best types to cultivate, provided that the yields per acre are satisfactory.

"As regards the relative values of white and black seed, it will be observed that the firm consulted expressed the opinion that a slight preference would be given to the former, as its oil cake or meal is of lighter colour and therefore more suitable for blending in the manufacture of feeding stuffs.

"Very little sunflower seed appears at the present time on the market in the United Kingdom, and shipments would be more readily saleable on the Continent of Europe."

From a consideration of these reports the following points emerge which are of value in assisting us to decide on the best type of sunflower to grow to meet the requirements of overseas markets:—(1) The prices recently obtainable for sunflower seed for oil-crushing purposes in England—namely, £10 10s. to £11 per long ton—are not remunerative to the grower in this Colony. (2) For the oil-crushing trade the percentage oil content of the seed is the most important factor; but of two samples, white and black in colour, having an equal oil content, some preference would probably be shown for the white, as the meal residue after crushing is lighter in colour, and for that reason is more valuable for use in the manufacture of animal feeding stuffs. (3) For the oil-crushing trade regular supplies in parcels of 500 tons, or about 11,000 bags of 100 lbs. each, are required by oil millers. (4) For the bird seed trade the chief requirement is that the seed be large, broad and plump. As regards colour, the preference is for white and striped seed. The

long, thin type of seed is not liked. (5) For the bird seed trade—which is small compared with the oil-crushing trade—the requirements of the buyers will seldom exceed 50 tons in one parcel, and only occasionally will sales of this magnitude be effected. (6) The highest price for sunflower seed obtained recently was £18 per ton c.i.f. London for Rhodesian white seed, but prices generally have fallen since then, and the general tendency of the market is to weaken, owing to the large supplies now available from Russia. (7) The bird seed trade offers very remunerative prices for Rhodesian sunflower seed of the right type, but the market is restricted and uncertain. (8) The oil content of the seed is of no importance in the bird seed trade, for the No. 5 sample, to which is assigned the highest value for this trade, is given the lowest value from the point of view of the oil-crushing trade, owing to its low oil content.

To sum up these points briefly, it would appear that this Colony cannot at present compete in the overseas oil-crushing trade in sunflower seed, but that it can successfully enter the bird seed market with the large, broad, plump white or striped types of seed, and also to some extent with the large, plump, black seed. The bird seed market is only small and somewhat uncertain.

The supplies from Russia are the chief factor affecting the prices both in the oil-crushing trade and the bird seed trade.

Finally, if Rhodesian sunflower seed could be decorticated and exported in this form it would probably find a considerably wider market than exists for undecorticated seed.

Commercial Rabbit Breeding in Southern Rhodesia.

By Captain Edgar S. Everett, Hovere, Banket.

(*We accept no responsibility for the statements contained in the following article, but are assured by Captain Everett that the prices quoted are fully authenticated.*—Ed.)

In view of some important changes in the commercial rabbit industry, the Editor has been good enough to allow me to give some particulars of the present position. Angora wool, which for some time has been difficult to dispose of, is now in demand in England. There has recently sprung up in America a large market for garments and fabrics made of Angora wool. The prices at present offered, although on the low side owing to quantities of wool stored during the slump being available, will in all probability rise in the near future; but at the prices offered breeders will realise a very good profit, and those wishing to dispose of wool should get into touch with one or other of the firms or societies mentioned.

A list of the leading buyers of Angora wool, together with the prices offered, is given below:—

The Secretary, Midland Angora Yarn Society, Ltd., Dunsley Grange, Bourne, Lincolnshire.

This society offers shares to prospective members, and each share will entitle the holder to sell 4 lbs. of wool per annum to the society. There is, as far as I know, no restriction placed on the number of shares that may be bought by one member, and the society will give the following prices for wool:—

1sts—35s. per lb.
2nds—30s. per lb.
3rds—15s. per lb.
4ths—7s. 6d. to 10s. per lb.

Messrs. Walter Berry & Sons, Ltd., Proprietors of "Regal Pure Rabbit Wool," Deighton Mills, Huddersfield, offer—
23s. per lb. for 1sts.
14s. per lb. for 2nds.

and will give a two years' contract, at the above prices, to any breeder desiring such contract.

The Derwent Mills, Matlock, Derbyshire—
1sts—Price given unknown.
2nds—25s. per lb.
3rds—7s. 6d. to 10s. per lb.

Messrs. Minchen & Matthews, Pencombe Hall, Pencombe, Worcester, offer—
1sts—29s. per lb.

Angora wool is now being spun so fine that ladies' hose, as fine as those of cotton (with no fluff at all), are being made, and yarn embroidery, as thick as 4-ply wool, is being successfully manufactured.

From the quantity of Angora wool which was imported by Great Britain and Northern Ireland during October of 1929, viz., 40 cwt., value £3,397, it will be seen that the demand is not merely mythical.

The fur rabbit situation continues to improve owing to the further scarcity of natural wild pelts, and the skins of fur rabbits may be sold almost anywhere in London at from 10s. to 17s. 6d. each according to type and quality.

Although I have only given the names of a few buyers of Angora wool and none of purchasers of pelts, I shall be glad, on receipt of a stamped envelope, to supply anyone interested with a further lot of names of dealers in Angora wool or pelts.

An Effective Baboon Trap.

CONSTRUCTION AND MODE OF WORKING.

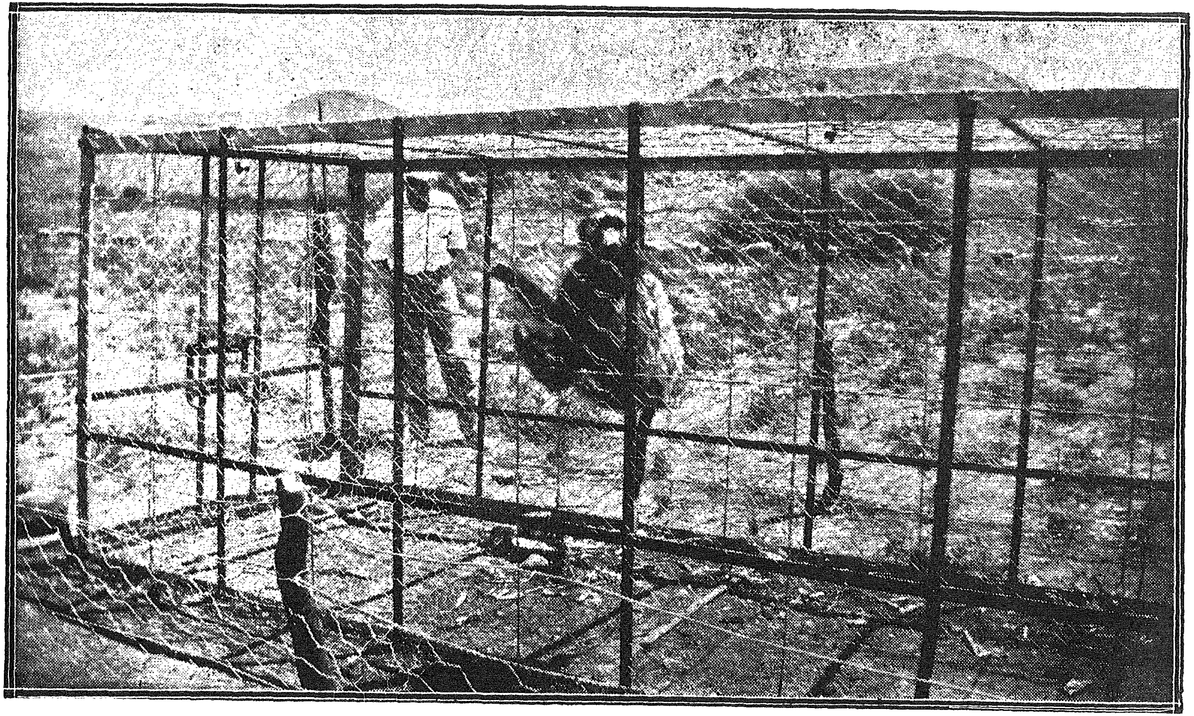
By C. R. Pfohl.

(Reprinted by courtesy of *The Farmers' Weekly.*)

The following is a description of a baboon trap which has given satisfactory results at the Grootfontein School of Agriculture, some twenty-two baboons having been taken in a short period.

Fig. 1 shows how the trap is worked and its general construction. Fig. 1 is only intended to show the method of construction and how the trap works. The trap is made of iron standards and slat iron. The door-frame is the only part that is made out of wood. The wire netting is double, as the baboons have been known to bite it off. The trap is 5 feet broad, 5 feet high and 14 feet long, and the gate is 2½ feet broad. Any kind of food can be used as an enticement, although maize cobs serve the purpose best. The general lay-out of the trap will be gathered from the illustration showing the completed trap and one of its captures. The whole frame is covered with strong wire netting.

The way in which the trap works is simple. One end of the trap consists of a grooved frame, in which a gate slides in grooves as shown. A thin wire is attached at A, carried over the pulley B, thence to pulley C, and the end, to which a ring is attached, slips over the peg D, fitting into a hole in the cross-bar (also shown in Fig. 2). The fit must be quite loose, so that the slightest pull will release it. The length of wire must be adjusted so that when the bottom of the door touches the bottom of the frame, the ring at the end of the wire will not jam at C. At E, at the top of the



The baboon trap and a capture. (Courtesy "Farmers' Weekly.")

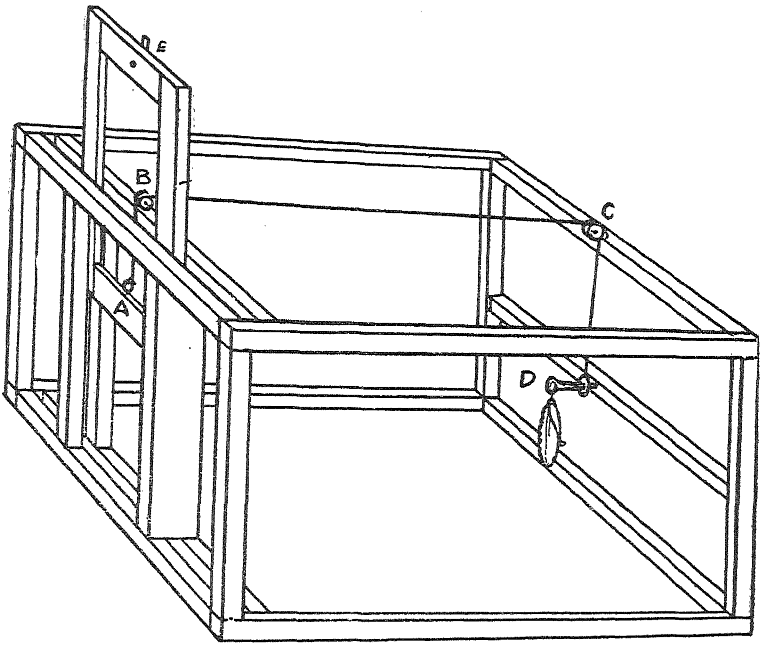


Fig. 1.

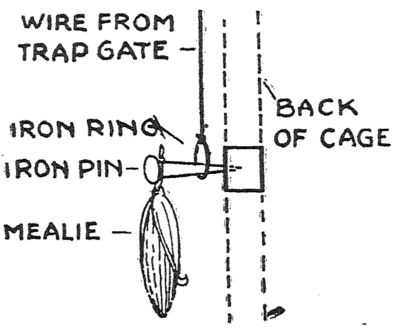


Fig. 2.

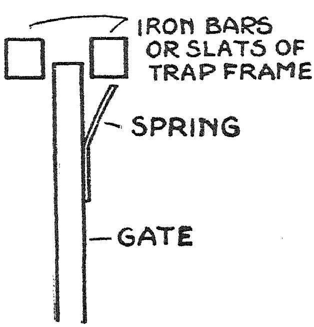


Fig. 3.

door, a stop is fixed. This is made of a piece of spring steel pointing upwards and outwards. It must be fixed in the position shown in Fig. 3. As the door drops the spring passes easily through the top bars of the frame, but springs back to position when through the aperture and so prevents the gate being lifted by any inmate. The top stile of the door must be made wide enough to allow the spring to be fixed in the right position to act. The bottom stile of the door should be weighted to make the door drop easily.

THE BAIT.

A cob is tied to the pin, with one or two or even more cobs round about the pin. When the baboon pulls this cob the iron pin is pulled out, the wire holding the gate up is freed, and the gate, being heavy, drops down in the groove in which it is made to slide. The wire used for keeping the gate up must be fairly pliable; usually the ordinary thin blue wire is used.

The cage must be well made and the bottom too must be covered with wire, otherwise the baboons burrow underneath. The baboons must on no account be killed in the cage by means of a rifle; all blood must be kept away from the trap. The captured baboons are usually killed with cyanide capsules. These are put into dates or other dainties, which are then given to the baboons. The very second the animal bites this tablet the liquid in it changes into a gas, which kills him instantaneously. All people near the cage must keep above the wind, for a whiff of the gas might cause death. The killed baboons must be removed as soon as possible and taken right away from the cage.

A low fence should be erected round the cage to keep sheep out of it.

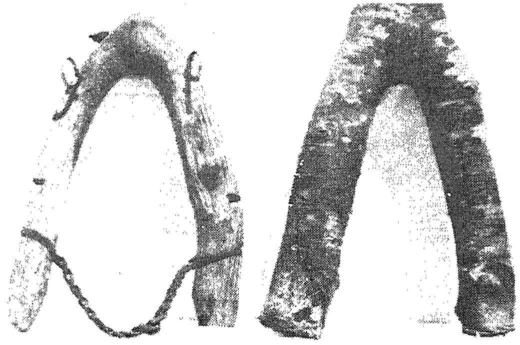


FIG. 1.

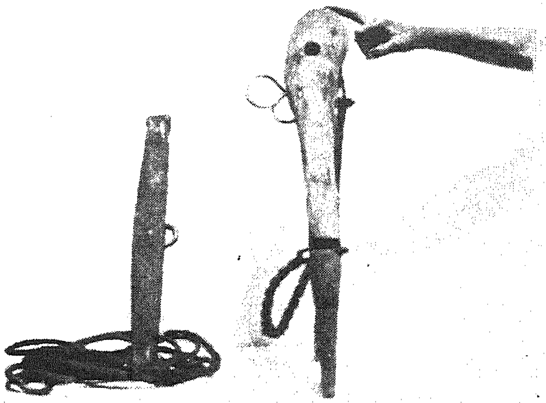


FIG. 2.

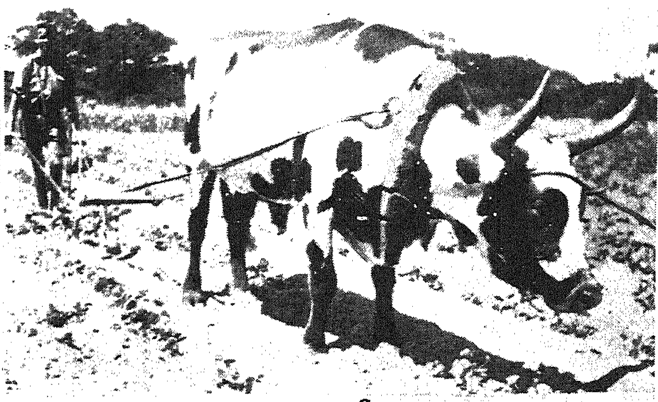


FIG. 3

A Useful and Inexpensive Single Ox Yoke for the Farm.

By C. A. Kelsey Harvey,
Manager, Tobacco Experiment Station, Salisbury.

There are reproduced herewith three photographs of a single ox yoke made from native timber which has been doing effective work on the Tobacco Experiment Station this season. This yoke was devised principally to cultivate closely spaced crops such as beans, ground nuts and Sunn hemp grown for seed. The ordinary type of double cultivator yoke is generally too cumbersome when crops are spaced less than 3 feet apart. It was also found useful for cultivating up and down the lines of tree plantations on the station, and should be useful for the late cultivation of "witch weed" infested maize crops.

The yoke is cut from a forked branch of M'sasa or M'hasha wood and shaped with an adze to fit the animal's neck. Two ring bolts are inserted 8 inches to 10 inches from the top of the yoke, to which are attached the traces made of ordinary reims. The two ends of the fork are shaped like skeys and are notched to take the strop. The yoke when completed is 2 feet 6 inches in length, and weighs 12 lbs. when the wood has dried out.

Bee-Keeping in Rhodesia.

QUEEN REARING—RE-QUEENING.

By T. Savory.

These terms, though apparently much the same in meaning, bear two widely different applications in countries where the rearing of queen bees is carried on as a sole undertaking. In the United States of America queen rearing is a business in itself and gives whole-time occupation to many who specialise in it. Bee-keeping, however, is not sufficiently forward in Rhodesia to justify any single individual in taking up queen breeding as a business, though that may perhaps come about in a short while. In the meantime the apiarist must remain content with some such basis for re-queening as is here given, and which should properly come under that heading.

It should be one of the first axioms of bee-keepers to recognise that the success of all their operations is—as with other stock propositions—mainly dependent upon the breed and the qualities of the queen in the hive. Upon her special points depend the egg-laying powers, the gentleness or otherwise of the colony when handling, industry in collecting and storing honey, the clean working of the comb frames and all parts of the hive, excessive use of propolis, and tendency to breed too many drones (some may lay two or even more eggs in one cell). Some colonies may laze and loaf, storing little or no surplus honey, etc.; in fact, the aim must be to select the most perfect queen to breed from. Drones, of course, have a good deal to do with queen selection, but it may be safely said that 75 per cent. of bee nature or qualities are derived from the queen. This fact gives excellent ground to work upon.

One of the most wonderful facts in all apiary work is that, when by any mischance or accident, illness, disease, etc., an active queen is lost to the hive—which, by the way, is a very rare occurrence—the workers of that particular colony have the power to rear another queen from one, two or more of the eggs or young larvæ that there may be on one of the frames at the time. Thus as soon as the queenless state of the hive is known to the colony the workers select one or more eggs or young larvæ and start to build round the cell or cells selected what is known as a queen cell. This takes the shape of an elongation of the cell, much resembling in size and form an ordinary pea-nut. These cells, as they are drawn out, are supplied with a substance known as royal jelly, which, according to generally accepted statements, is a more highly digested and concentrated form of food than is as a rule supplied to the worker bee of the colony. The cell is then sealed as usual for the inmate to run its course of hatching, and it is this cell which in the right time will produce a properly formed queen bee. It is this curious and wonderful fact of natural history that this article will deal with for the purpose of re-queening. There are other means, as, for instance, that of uniting as described in a former issue of this Journal, by the smoke, the newspaper, or the gauze plan, etc. The former, however, is nature's real plan, and with care should never fail.

The first thing to do is to select the colony from which to breed a queen. Breeding can be carried out at short intervals during the spring, summer and autumn from any one or more given hives, and unless the bee-keeper is breeding from an imported Italian queen, he will select a colony that is noted in his hive register as the best in his possession for the qualities already mentioned. Select a hive in perfect order and condition, with its three coats of paint, preferably of white or green, or as an alternative a khaki colour. This should be filled with dummy frames, otherwise known as division boards, leaving space enough in it for four other frames, as will be seen later on. These division boards are for the purpose of filling up the hive chamber and keeping the "nucleus" warm until they can be replaced later on by the regular frames of foundation. Over the whole of these should be placed a well-fitting quilt, then a ventilator lid

and the final lid on that. A length of thick string should be passed round the whole so as to make sure that when moving the hive to its actual site the different parts do not shift and allow the inmates to emerge. Next close the hive entrance by a light frame of mosquito wire netting stretched on wood and wedged into position, leaving the usual entrance closers handy for use when, 48 hours later, the netting is partly removed. One more addition the writer has found of much use in newly swarmed hives or colonies is the Alexander feeder; this fits in a hole cut in the back of the hive and slides in on the bottom, the space above being filled with shallow dummies instead of the deep ones. This, except in the case of swarms hived during a honey flow or in mid-summer, is invariably used. It seems to act as the most perfect feeder on the market without the slightest fear of robbery, and when the need for its use is finished with it can be easily withdrawn and the plug to re-fill the space can be screwed on with little trouble.

Next get a four or five frame box—a spare that should be in every bee yard—in which must be placed four deep frames fitted with full foundation sheets; if four fully drawn out old frames are available, such would be preferable. Now take the hive and frame box to a spot a foot or two away from the hive to be operated upon, just near enough to reach and deal with comfortably and place it on a table or stand about a foot above the ground. Near at hand have a kitchen spoon, a knife, bee brush, a couple of spare quilts, hive opener, smoker, and veil and gloves. Everything is now in readiness for the operation. After a puff or two of smoke at the entrance, remove the roof, lid and ventilator, then gently turn the quilt from the first side frame, and, after examining it to make sure that the queen is not on it, place it down on the outside of the hive. This will give the operator plenty of room to move the other frames as required. As a rule the two outside frames on either side of the hive are reserved by the queen for the storing of honey, and are not used for laying in, so these can often be used as the two frames of honey for the "nucleus" to feed upon. Here it might be said that if possible these two frames should be placed in the new hive first, as when once the two frames of brood and eggs and bees are placed they should

be secured and closed up as quickly as possible; otherwise the adhering bees will do their best to escape, and will probably succeed, leaving too few in number to do their work properly. Now go through the remaining frames carefully and thoroughly in order to make sure that the queen is seen. As soon as she is found place the frame with her on it as near to the side as may be, and then quickly select two frames containing eggs and young unsealed larvæ with as many bees adhering to them as can be managed to secure on them and place them in the new hive, which, with the two frames of honey already put in, will make a total of four. Cover up all with the quilt, put on the ventilator lid, then the top lid, tie the lot up securely with the string or cord (*i.e.*, hive floor, body and lids), and remove the whole to some spot in the workshop. Here it should be left for 24 hours, and inspection made from time to time to see that all appears to be going on well inside. The inmates can be seen through the netting covering the entrance, the width of which should be contracted by the closers to about four to six inches so as to keep the inside of the hive nice and warm, not forgetting to lay over the protruding top of the feeder outside a strip of thin wood of its size, with a small stone to keep it in position. At the end of 48 hours remove the hive, or what is now known as the "nucleus," to its position decided upon in the apiary, unfasten the entrance closer and withdraw the netting frame so as to leave an opening of about four inches in width; this can be enlarged later on as the colony increases in number. At this stage it is best to leave the "nucleus" severely alone for at least four or five days and then only to inspect it slightly for the purpose of making sure that the inmates have accepted the position. This will be determined by the fact of the queen cells being in the process of making. At the end of twenty-eight days, which provides for the fifteen days of the total period of the growth of the new queen, and eleven more for her full development, the hive can be carefully opened, when almost invariably the owner will have the satisfaction of seeing his newly made young queen in the full process of egg laying and the forming of a strong colony.

All that now remains to be done is to watch the hive, from time to time adding fresh frames of full foundation,

or better still, old drawn-out frames, which, by being ready for the queen to lay her eggs in straight away, will save all the time, labour and honey that would otherwise be used in drawing out the plain foundation sheets to the regular combs. For every pound weight of such comb the bees use from 12 to 14 lbs. of honey. After the ten regulation frames have filled up the hive, then will come the question of adding a second brood chamber as may be decided or the placing of another crate of shallow frames for the storing of surplus honey.

It might be added that the feeder is quite optional, and is only mentioned as an extra precaution, in case the "nucleus" should require feeding during the process for the first thirty days. This will depend altogether upon the time of the year and the state of the honey flow, or supply of food provided for the "nucleus."

Rhodesia Agricultural Journal.

Mr. H. Oddin-Taylor, Kafue, Northern Rhodesia, has for disposal 85 back numbers, dating from October, 1920. He invites offers for these f.o.r. Kafue, and prefers to sell in one lot if possible.

Points to be Observed in Cream Production.

Issued by the Dairy Branch of the Department of Agriculture.

1. Scald the separator and all other utensils before use.

2. Clean all utensils immediately after use. Rinse first with lukewarm water, then scrub with brushes and hot water, rinse again and finally scald the utensils with boiling water.

3. Separate the milk as soon as possible after milking. Don't separate at a temperature below 90° F.

4. Strain the milk into a separator.

5. Separate into clean, empty vessels. Don't collect the cream in vessels containing cream from the previous separation.

6. Cool the cream as quickly as possible after separation and keep the cream cool pending despatch to the creamery.

7. Never mix warm cream with that which has already been cooled. When thoroughly cool, the fresh cream can be mixed with the older cream.

8. Keep the cream in a clean vessel covered with butter muslin. Don't store cream in closed vessels or cans.

9. Stir the cream three times a day; stir thoroughly on each occasion, and use a stirrer with a plunger attachment.

10. Adjust the cream screw to deliver a cream testing about 45 per cent. of butter fat.

11. Despatch the cream to the creamery at least three times a week in summer.

12. Keep the cream cool whilst in transit to the creamery. Cover the cans with wet sacks or blankets.

13. Scald and air the cans immediately they are received back from the creamery and scald again before use.

Southern Rhodesia Weather Bureau.

JANUARY, 1930.

Pressure.—The mean barometric pressure was generally high, the highest being Fort Victoria with 0.045 in. above normal, and the lowest Salisbury with 0.007 in. above normal.

Temperature.—The mean maximum temperatures were generally below normal, varying from 7.4° F. below normal at Riverdene North to 0.7° F. above normal at Sipolilo. The mean minimum temperatures were generally about normal, varying from plus 1.9° F. at Enkeldoorn to minus 2.0° F. at Sinoia. The mean temperatures for the month were, therefore, below normal, the highest being Melsetter with 0.4° F. above normal, the lowest Riverdene North with 3.9° F. below normal. The humidity for the month was just about normal at most stations.

Pressure Fluctuations.—The country was visited by five marked high pressure systems during the month. A high appeared on the S.W. coast on the 1st, and passing round the coast was off Beira on the 4th and 5th. The second high was weak; it appeared off the W. coast on the 4th, and was well to the S.E. of Rhodesia on the 6th to 9th. The third high appeared on the W. coast on the 9th, and appeared to reinforce the pressure at Beira without any definite move. The pressure remained high at Beira until the 14th. The fourth high was the deepest for the month; it was on the W. and S. coasts from the 17th to the 21st; it then moved round and remained to the south of Rhodesia until the 25th. The fifth high appeared on the W. coast on the 27th and 28th; it then moved rapidly, being on the S. coast on the 29th, to the S. of Rhodesia on the 30th, and then moved off. The equatorial low showed very slight activity in the first part of the month. A low appeared, however, on the 13th, which

developed steadily, and eventually traversed S. Rhodesia from W. to E., being central on the 19th. During the latter portion of the month Rhodesian pressure was dominated by highs.

Rain Periods.—Rain periods were not well defined during January. A dry period extended from the 1st to the 9th, 12th to the 14th, and 27th to 29th. Isolated showers fell on the 1st and 2nd and again on the 5th and 6th. A short period of rain occurred in the north and centre on the 10th and 11th, followed by light showers from the 12th to 14th. Good rains commenced on the 15th, when showers were fairly general and heavy in the N.; on the 16th and 17th showers were general and heavy in the W.; on the 18th, with the equatorial low approaching, showers were general and heavy in the W.; on the 19th general rain occurred; on the 20th the showers were general, except in the W., and on the 21st fairly general. On the 22nd and 23rd showers were fairly general in Mashonaland, and on the 24th scattered showers only. On the 25th and 26th showers were numerous except in the east, and a few isolated showers fell on the 27th to 29th. On the 30th and 31st numerous showers were reported in Mashonaland.

Rainfall.—The rainfall for the month of January amounted to 5.10 ins., as compared with the normal of 7.20 ins., and the total rainfall to date is 15.89 ins., with a normal of 16.95 ins., or 1 inch below normal. The deficiency is most marked in Zone B, S.E. Matabeleland, where the total to date amounts to 10.6 ins.

RAINFALL.

Station.	1929-30.		Total to end of period.	Normal rainfall to end of period.
	Dec.	Jan.		
Zone A.:				
Bubi—				
Bembesi Railway ...	4.41	4.02	14.17	14.34
Glenarton ...	4.23	4.69	11.00	12.56
Inyati ...	4.94	2.69	17.50	15.22
Judsonia ...	4.00	2.75	11.37	n.s.
Martha Farm ...	4.31	...	...	10.23
Nduba Farm ...	2.33	2.86	12.80	n.s.
Shangani Estate ...	4.50	3.83	14.19	15.86
Bulalima-Mangwe—				
Centenary ...	3.83	7.01	16.82	12.90
Kalaka ...	3.27	3.86	15.96	11.56
Riverbank ...	3.61	4.45	12.89	15.28
Solusi Mission ...	3.85	3.91	12.55	14.62
Bulawayo—				
Fairview Farm ...	6.17	...	...	13.84
Keendale ...	3.82	5.79	18.43	13.88
Crowhurst ...	3.70	6.40	13.99	14.69
Observatory ...	4.14	5.69	14.38	15.09
Waterworks ...	4.03	5.13	13.05	13.52
Gwelo—				
Brockenhurst ...	4.40	1.35	12.72	n.s.
Frogmore ...	8.43	1.93	17.20	n.s.
Gwelo Gaol ...	6.81	1.39	14.69	16.12
Riversdale Estate ..	...	...	...	15.68
Somerset Estate ...	3.71	1.51	9.58	15.86
Insiza—				
Orangedale ...	3.42	3.07	11.61	16.61
Shangani ...	4.81	2.79	13.14	14.76
Thornville ...	4.33	1.84	10.32	14.20
Nyamandhlovu—				
Gwaai Reserve ...	7.10	5.58	16.50	12.11
Gwaai Siding ...	6.83	4.10	15.02	n.s.
Naseby ...	3.69	4.55	11.17	13.42
Nyamandhlovu Railway ...	3.68	3.67	11.14	15.05
Sebungwe—				
Gokwe ...	8.56	6.61	17.74	17.86
Umzingwane—				
Springs ...	2.61	6.72	13.86	14.45
Wankie—				
Dett ...	10.77	8.72	21.65	12.46
Matetsi Railway ...	7.07	3.72	12.87	16.09
Ngamo Railway ...	6.66	5.68	14.76	14.44
Rosslyn ...	5.21	8.09	16.53	n.s.
Sukumi ...	7.61	6.12	16.19	15.12
Tom's Farm ...	4.61	5.22	13.75	n.s.
Victoria Falls ...	6.80	11.30	20.40	n.s.
Victoria Falls Railway ...	7.28	10.89	20.32	17.19
Wankie Hospital ...	6.15	6.18	13.06	14.28

RAINFALL—*(Continued)*.

STATION.	1929-30. Dec.	Jan.	Total to end of period.	Normal rainfall to end of period.
ZONE B.:				
Belingwe—				
Bickwell ...	4.22	2.92	15.08	13.26
Sovelele ...	2.09	...	...	9.34
Tamba ...	1.79	..	...	11.10
Wedza ..	3.56	...	...	13.70
Bulalima-Mangwe—				
Bruwapeg ...	3.73	...	...	10.99
Empandeni ...	1.72	...	...	13.90
Fallowfields ...	2.67	4.76	11.23	n.s.
Garth ...	2.51	4.05	10.48	16.40
Maholi ...	...	...	...	18.33
Retreat ...	4.15	4.25	12.71	13.65
Sandown ...	3.61	3.34	11 69	13.80
Semokwe Reserve ...	4.15	6.31	13.34	n.s.
Tjankwa ...	2.36	4.31	10.79	16.75
Tjompani ...	7.65	4.53	15.57	14.62
Chibi—				
Bubye ...	...	...	...	8.30
Mtendelende ...	1.00	...	...	11.28
Nuanetsi Homestead ...	3.81	2.24	9.89	9.54
Nuanetsi N.C. ...	4.37	1.82	12.18	n.s.
Gwanda—				
Gwanda Gaol ...	1.66	4.77	10.52	13.26
Limpopo ...	1.70	1.75	6.14	8.21
Mazunga ...	1.97	...	...	10.28
Mtetengwe ...	1.67	1.56	6.98	6.74
Tuli ...	4.42	...	...	9.31
Insiza—				
Albany ...	3.85	2.55	12.41	15.31
Filabusi ...	2.27	6.83	14.83	14.10
Fort Rixon ...	5.28	3.12	13.23	13.68
Inyezi ...	3.83	4.37	13.93	13.71
Lancaster ...	2.35	6.19	13.88	13.65
Scaleby ...	3.52	4.18	12.37	n.s.
Wanezi Mission ...	5.18	4.03	14.76	n.s.
Matobo—				
Bon Accord ...	1.13	2.45	8.72	n.s.
Fort Usher ...	3.32	5.89	12.76	n.s.
Holly's Hope ...	2.09	2.96	10.79	12.43
Longsdale ...	3.73	4.44	15.53	n.s.
Matopo Mission ...	2.94	6.40	14.89	15.92
Mtshabezi Mission ...	2.00	3.84	10.28	13.70
Rhodes Matopo Park ...	2.96	5.10	13.30	15.39
Umzingwane—				
Balla Balla ...	2.93	6.43	14.32	14.69
Essexvale ...	3.78	8.08	18.26	14.48
Hope Fountain ...	4.90	5.27	16.34	16.68

RAINFALL—(*Continued*).

STATION.	1929-30. Dec.	Jan.	Total to end of period.	Normal rainfall to end of period.
ZONE C.:				
Charter—				
Bushy Park ...	6.55	4.10	13.78	17.96
Enkeldoorn ...	8.42	5.32	18.15	18.07
Marshbrook ...	8.22	7.60	24.97	18.11
The Range ...	8.43	4.54	20.13	18.32
Vrede ...	5.93	6.41	19.55	18.57
Chilimanzi—				
Beacon Hill ...	6.88	3.08	14.55	15.69
Central Estates ...	5.87	3.64	15.51	19.63
Fourie's Post ...	5.15	1.95	9.80	14.00
Orton's Drift ...	7.69	3.25	16.49	15.05
Sebakwe Post ...	6.59	4.08	15.54	14.98
Umvuma Railway ...	6.26	4.22	14.48	17.72
Gwelo—				
Cross Roads ...	4.46	3.58	12.30	16.71
Delano Estate ...	7.70	3.36	13.37	n.s.
East Clare Ranch ...	6.11	4.62	14.59	17.14
Forestvale ...	7.10	2.73	14.78	n.s.
Globe and Phœnix Mine ...	3.87	3.73	15.98	16.82
Lannes Farm ...	4.96	3.32	14.12	n.s.
Lalapanzi ...	5.41	2.61	13.26	21.01
Lyndene ...	7.74	2.37	17.16	14.81
Woodendhove ...	5.91	...	...	17.90
Wold Farm ...	5.82	2.79	13.21	n.s.
Hartley—				
Ardgowan ...	14.20	...	...	18.15
Balwearie ...	7.79	...	...	17.95
Battlefields ...	6.81	9.94	20.00	16.70
Beatrice ...	6.35	3.48	14.80	17.47
Carnock ...	6.08	7.51	23.98	19.21
Cromdale ...	7.42	7.14	20.79	18.64
Currandooley ...	8.36	5.97	17.53	n.s.
Eiffel Blue Mine ...	5.63	4.64	15.23	15.18
Elvington ...	9.43	6.70	22.55	19.26
Gatooma ...	5.07	6.07	15.48	18.76
Cotton Breeding Station ...	6.05	4.83	15.48	n.s.
Gowerlands ...	9.05	5.65	20.68	18.63
Handley Cross ...	4.71	5.19	12.98	n.s.
Hartley Gaol ...	6.03	4.69	18.31	19.58
Hopewell ...	10.37	3.78	20.86	17.84
Jenkinstown ...	7.42	6.11	20.14	18.61
Maida Vale ...	6.06	3.31	12.60	16.73
Meadowlands ...	8.71	9.31	23.39	n.s.
Nyadgori ...	9.22	5.96	20.74	16.68
Pulham ...	8.26	6.88	21.95	20.83
Ranwick ...	8.28	5.01	21.51	19.47
Sunny Bank ...	8.33	5.37	16.41	n.s.
Thorndyke ...	7.23	3.92	16.92	17.48

RAINFALL—(*Continued*).

STATION.	1929-30. Dec.	1929-30. Jan.	Total to end of period.	Normal rainfall to end of period.
ZONE C.—(Continued)				
Lomagundi—				
Argyle ...	4.97	7.43	19.64	20.29
Baguta ...	5.94	10.56	20.87	18.53
Between Rivers ...	7.06	7.76	19.43	n.s.
Citrus Estate ...	7.10	10.48	20.46	17.97
Strathdon ...	6.17	7.69	19.23	n.s.
Darwendale ...	5.46	3.10	15.14	17.77
Dedsi ...	6.75	8.25	19.15	18.62
Dingley Dell ...	5.26	9.36	17.54	16.16
Gambuli ...	3.85	7.13	15.24	20.23
Kapiri ...	6.06	6.09	18.13	18.26
Kashao ...	4.86	7.22	17.86	n.s.
Kenidia ...	3.23	5.07	14.67	n.s.
Mafoota ...	9.07	5.82	19.67	17.38
Maningwa ...	5.49	9.31	19.99	14.96
Miami ...	4.22	5.13	14.78	n.s.
Mica Field ...	4.02	5.26	11.60	15.43
Montrose ...	4.43	8.57	21.22	17.10
Mpandegutu ...	7.59	9.92	22.41	17.14
Msina ...	4.61	8.90	18.57	n.s.
Mukwe River Ranch ...	5.12	6.81	18.77	18.02
Nyapi ...	4.37	8.28	17.34	17.30
Wari ...	5.43	7.41	17 03	16.95
Nyati ...	5.22	9.17	19.12	14.65
Palm Tree Farm ...	6.67	9.34	21.89	17.82
Pendennis ...	4.75	3.41	14.10	n.s.
Raffingora ...	...	...	...	17.87
Renardia ...	7.43	6.26	19.99	19.19
Richmond ...	6.94	4.67	17.22	15.61
Robbsdale ...	5.99	5.49	16.93	n.s.
Romsey ...	...	...	...	17.29
Silaler Estate ...	6.08	6.13	16.01	20.14
Sinoia ...	5.15	9.27	18.85	18.55
Sipolilo ...	10.10	7.59	19.60	19.07
Umvukwe Ranch ...	8.28	6.94	19.94	20.52
Woodleigh ...	4.97	11.59	22.19	18.73
Yeanling ...	4.07	7.26	18.48	18.21
Zebra Vlei ...	3.15	...	...	17.86
Marandellas—				
Rocky Spruit ...	12.85	5.70	27.90	26.99
Mazoe—				
Pembi Ranch ...	10.32	6.25	19.77	n.s.
Salisbury—				
Avondale (Broadlands) ...	6.54	7.73	18.57	19.55
Ballineety ...	6.47	4.06	15.87	17.83
Botanical Experiment Station	7.24	5.10	18.33	16.30
Bromley ...	9.44	7.77	25.86	19.45
Cleveland Dam ...	7.67	5.96	20.50	18.34
Forest Nursery ...	7.83	3.49	17.01	19.13
Gwebi ...	6.41	5.93	17.16	18.51

RAINFALL—(*Continued*).

Station.	1929-30. Dec.	1929-30. Jan.	Total to end of period.	Normal rainfall to end of period.
Zone C.—(Continued)				
Salisbury (continued)—				
Salisbury Agricultural Dept.	6.59	3.90	16.13	16.99
Sebastopol ...	7.24	5.54	19.38	18.81
Stapleford ...	5.11	4.20	14.96	20.06
Tobacco Experiment Station	6.40	3.21	16.70	20.55
Western Commonage ...	5.54	7.62	19.70	15.62
Sebungwe—				
Sikombela ...	9.04	...	...	18.03
Wolverley ...	7.14	5.10	14.41	15.28
Zone D. :				
Darwin—				
Cullinan's Ranch ...	10.36	5.30	19.34	17.17
Mount Darwin ...	5.75	6.40	16.25	18.69
Rusambo ...	5.89	8.08	19.02	n.s.
Inyanga—				
Inyanga ...	8.30	5.33	18.97	21.46
Juliasdale ...	13.98	5.67	27.57	23.20
Rhodes Estate ...	8.36	4.18	20.32	24.18
Makoni—				
Ardlamont ...	5.74	7.20	23.74	n.s.
Eagle's Nest ...	5.95	7.71	23.99	19.42
Mayo Ranch ...	10.80	3.74	17.71	n.s.
Wensleydale ...	...	...	...	17.36
Mazoe—				
Argyle Park ...	6.42	7.16	18.07	20.86
Atherstone ...	10.05	9.15	24.01	18.07
Bellevue ...	5.86	5.85	17.55	19.39
Bindura ...	6.00	6.19	16.35	17.50
Ceres ...	9.67	7.55	22.62	20.78
Chipoli ...	12.24	6.64	25.65	18.66
Citrus Estate ...	8.47	4.87	19.00	19.32
Craigengower ...	9.53	6.86	20.39	18.84
Dandejena ...	12.94	5.20	20.59	n.s.
Donje ...	11.75	5.29	20.25	n.s.
Frogmore ...	10.90	8.11	22.39	19.05
Glen Divis ...	8.59	8.36	21.51	20.95
Glen Grey ...	6.90	5.49	16 34	18.94
Great B ...	5.89	8.99	20.30	18.79
Hinten ...	6.60	3.00	13.10	15.53
Horta ...	9.92	5.93	21.11	n.s.
Kilmer ...	9.32	6.77	20.74	19.55
Kingston ...	10.65	8.87	23.95	20.88
Maienza ...	11.72	...	...	19.31
Marston Farm ...	7.68	6.51	18 30	n.s.
Mazoe Dam ...	8.46	5.44	19.92	17.85
Mgutu ...	6.20	5.62	16.64	21.44
Muripfumba ...	11.15	7.34	24.06	16.37
Omeath ...	8.78	7.26	23.17	19.06

RAINFALL—(*Continued*).

Station.	1929-30. Dec.	Jan.	Total to end of period.	Normal rainfall to end of period.
ZONE D.—(Continued)				
Mazoe (continued)—				
Pearson Settlement ...	4.58	5.37	14.70	18.66
Riversdale Estate ...	5.91	6.27	16.18	18.18
Ruia ...	10.04	5.92	22.42	20.39
Rustington ...	11.48	8.20	26.42	15.74
Shamva Mine ...	10.86	6.16	23.52	19.04
Stanley Kop ...	7.74	7.36	21.16	17.35
Sunnyside ...	8.61	6.82	21.65	19.28
Teign ...	7.31	5.21	16.84	19.61
Usk ...	10.12	10.21	26.67	20.27
Virginia ...	8.00	9.25	20.66	18.40
Visa ...	9.92	7.86	22.38	n.s.
Woodlands ...	11.65	...	...	18.27
Zombi Farm ...	10.54	6.95	23.31	20.47
Mrewa—				
Maryland ...	7.48	4.00	19.81	n.s.
Montclair ...	5.57	6.53	20.78	n.s.
Mrewa ...	7.55	...	...	20.40
Nyaderi Mission ...	7.68	3.46	18.69	18.72
Selous Nek ...	12.10	4.05	21.20	21.39
Mtoko—				
Makaha ...	9.00	5.26	17.38	20.10
Mtoko (N.C.) ...	16.21	5.64	27.65	18.23
Rukore ...	...	...	...	n.s.
Salisbury—				
Arcturus ...	4.66	5.89	20.28	20.26
Chindamora Reserve ...	5.85	5.81	17.80	20.28
Glenara ...	5.25	6.97	15.94	19.88
Goromonzi ...	4.95	6.59	19.76	21.35
Hatcliffe ...	8.05	4.38	15.61	19.71
Hillside (Bromley) ...	9.93	6.67	25.03	19.96
Kilmuir ...	4.09	6.71	17.15	20.99
Meadows ...	7.17	6.75	23.02	22.51
Pendennis ...	9.75	3.69	16.60	n.s.
Selby ...	6.88	5.57	17.66	17.75
Springs ...	4.30	8.21	19.18	19.46
Teviotdale ...	7.90	4.78	15.79	n.s.
Vainona ...	7.49	3.87	15.17	19.11
ZONE E.:				
Belingwe—				
Belingwe (N.C.) ...	4.30	3.66	15.47	13.27
Doro ...	5.28	6.01	17.73	12.99
Shabani ...	4.05	3.70	10.46	13.33
Bikita—				
Angus Ranch ...	6.75	4.50	15.78	12.22
Bikita ...	5.60	7.04	22.48	18.66
Devuli Ranch ...	4.28	3.04	12.45	13.30
Pamushana ...	...	...	...	21.69

RAINFALL—*(Continued)*.

Station.	1929-30. Dec.	Jan.	Total to end of period.	Normal rainfall to end of period.
Zone E.—(Continued)				
Charter—				
Buhera ...	5.90	...	...	21.77
Chibi—				
Chibi ...	6.67	1.88	16.38	14.21
Lundi ...	4.88	12.04	25.36	12.75
Mpapas ...	4.64	6.51	16.02	10.67
Chilimanzi—				
Allanberry ...	5.62	4.06	17.91	17.89
Driefontein ...	3.60	2.80	10.17	17.15
Felixburg ...	4.27	2.28	12.38	16.77
Grootfontein ...	5.40	2.90	12.50	16.88
Induna Farm ...	3.11	3.66	10.25	20.39
Mtao Forest ...	4.82	6.38	14.57	17.26
Mukowries ...	3.61	6.41	14.05	n.s.
Thornhill ...	4.07	3.03	11.40	n.s.
Gutu—				
Alheit Mission ...	3.86	3.53	14.85	14.93
Devuli Store ...	5.34	...	...	n.s.
Eastdale Estates ...	8.03	3.97	19.07	19.33
Gutu (N.C.) ...	4.28	2.92	13.30	17.05
Glenary ...	3.01	3.64	14.86	15.11
Gwelo—				
Glencraig ...	7.92	4.07	17.04	19.39
Partridge Farm ...	6.54	3.30	15.73	18.51
Sheep Run Farm ...	4.52	2.47	12.14	16.15
Inyanga—				
St. Trias' Hill ...	9.87	5.30	27.00	22.63
Insiza—				
Roodeheuvel ...	4.17	4.71	15.48	16.34
Stoneham (Brae Valley) ...	3.78	5.18	13.79	n.s.
Makoni—				
Bude ...	8.87	...	...	n.s.
Craigendoran ...	8.25	4.22	20.26	20.02
Forest Hill ...	7.33	6.54	22.86	21.40
Gorubi Springs ...	...	...	...	21.57
Kairidzi ...	9.72	5.43	24.03	n.s.
Mona ...	9.16	6.11	25.83	22.05
Monte Cassino ...	6.55	10.38	27.84	20.51
Ruati ...	8 16	4.51	20.24	n.s.
Rusape (N.C.) ...	11.35	4.37	25.55	n.s.
Springs ...	11.35	4.59	26.24	23.58
Whitgift ...	8.52	3.49	19.64	n.s.
Marandellas—				
Bonongwe ...	9.01	6.26	23.68	19.05
Delta ...	11.88	7.01	27.24	20.35
Elandslaagte ...	8.46	5.58	22.88	19.86
Lushington ...	8.95	6.17	21.80	n.s.
Macheke ...	7.00	7.82	23.40	20.47
Marandellas (N.C.) ...	13.02	7.27	27.45	20.94

RAINFALL—*(Continued)*.

Station.	1929-30. Dec.	Jan.	Total to end of period.	Normal rainfall to end of period.
ZONE E.—(Continued)				
Marandellas (Continued)—				
Marandellas Estate ...	13.61	...	...	18.99
Nelson ...	11.85	4.36	24.77	18.44
Wedza Reserve ...	11.40	7.27	24.75	n.s.
Wenimbi ...	9.77	...	...	19.29
Melsetter—				
Brackenbury ...	11.64	6.89	26.12	32.17
New Year's Gift ...	5.61	5.13	17.57	n.s.
Sabi Tanganda Estate ...	4.65	3.50	12.00	n.s.
Ndanga—				
Bangala Ranch ...	4.61	6.35	14.81	n.s.
Doornfontein ...	7.04	3 38	18.65	15.63
Marah Ranch ...	8.50	3.15	16.22	18.63
Triangle Ranch ...	2.46	7.93	15.44	11.19
Zaka ...	4.75	4.34	16.29	n.s.
Selukwe—				
Aberfoyle Ranch ...	6.46	4.86	17.03	15.04
Hillingdon ...	5.77	4.84	16.37	19.08
Impali Source ...	6.23	3.75	14.41	14.17
Rio ...	6.17	2.97	15.58	17.50
Safago ...	7.27	3.27	17.81	19.32
Selukwe ...	10.68	5.88	25.38	19.28
Umtali—				
Argyll ...	6.38	3.09	15.86	20.75
Embeza ...	10.81	4.95	28.12	n.s.
Fairview ...	6.77	2.13	16.83	21.58
Fern Valley ...	5.96	3.09	16.91	21.37
Jerain ...	7.99	4.18	17.89	17.75
Mountain Home ...	10.20	7.08	27.14	n.s.
Mutambara Mission ...	5.88	3.12	15.02	17.33
Odzani Power Station ...	9.17	6.21	21.71	22.06
Park Farm ...	8.08	3.03	17.27	23.07
Premier Estate ...	7.80	4.86	21.18	19.26
Sarum ...	5.70	...	...	18.38
Sheba ...	15.28	10.08	39.22	n.s.
Stapleford ...	11.23	8.30	31.38	35.26
St. Augustine's Mission ...	10.13	4.17	22.14	21.92
Transsau Estate ...	6.27	2.33	14.05	19.30
Umtali Gaol ...	7.59	2.78	19.05	18.01
Victoria—				
Brucehame ...	6.67	2.01	14.24	16.67
Cambria ...	6.43	1.62	11.98	13.05
Cheveden ...	5.83	3.74	18.78	17.95
Clipsham ...	8.05	1.92	14.89	17.19
Gokomere ...	6.05	2.97	14.57	16.95
Kimberley Ranch ...	8.08	3.15	17.05	n.s.
Mashaba ...	6.01	4.63	16.84	15.36
Miltonia ...	5.97	2.18	12.29	n.s.
Riverdene North ...	5.22	2.00	14.04	15.68
Salemore ...	7.25	...	...	18.10

RAINFALL—*(Continued).*

Station.	1929-30. Dec.	Jan.	Total to end of period.	Normal rainfall to end of period.
Zone E.—(Continued)				
Victoria (Continued)—				
Silver Oaks ...	7.24	2.64	15.24	18.28
Stanmore ...	4.71	2.08	12.65	14.24
Victoria ...	6.89	2.18	13.77	15.78
Zimbabwe ...	7.99	3.08	16.68	14.89
Zone F.:				
Melsetter—				
Chikore ...	6.05	4.71	20.07	23.51
Chipinga ...	4.27	4.41	19.65	24.35
Lettie Swan ...	4.05	4.65	16.12	n.s.
Melsetter ...	4.14	3.95	20.60	25.49
Mount Selinda ...	6.98	8.57	24.71	31.66
Vermont ...	7.28	7.03	21.70	33.48
Umtali—				
Cloudlands ...	8.12	3.90	21.09	n.s.

Salisbury Experiment Station

FOR SALE.

KUDZU VINE CROWNS.

A limited quantity of kudzu vine crowns will be available for sale during January at the following rates:—

Large crowns ... ... 6d. each.
Small crowns ... ... 3d. each.

Prices are carriage free to any station or siding in Southern Rhodesia.

Purchasers are recommended not to plant small crowns, except on land which can be irrigated. Orders with remittances should be addressed to the Chief Agriculturist, Department of Agriculture, Salisbury.

Correspondence.

[No responsibility is accepted by this Journal for the views expressed by correspondents.]

Chikore,
Craigmore P.O.
18th February, 1930.

The Editor,
Rhodesia Agricultural Journal.

Sir,

Wheat Growing in Southern Rhodesia.

The article in the last, or recent, number of the *Agricultural Journal* is of interest to all in the country who are trying to raise wheat, and I have read it with benefit. I refer to that on Wheat Raising by Messrs. Hamman and Morkel, or based on their experience.

As we have been experimenting for many years in wheat growing, it may be of interest to others to hear of our methods, although I judge few are situated just as we are. Most of our wheat is raised without irrigation on high land, and we usually sow in March or early in April.

If desired, I will try to find time to make up and send in some notes for the Journal, but fear it will be too late to be of much use this year. Perhaps it could be used next year.

That article on the Humane Killing of Stock ought to be pressed home to all of us. It is too easy to get lazy and "let the boys do it" in a most unmerciful way. The less said about it the better for the peace of one's conscience. I am glad to see such articles.

We congratulate you on the make-up and contents of the Journal.

Yours very truly,
C. C. Fuller,
In charge of Station,
American Board Mission.

[We shall be very pleased to receive the notes referred to for publication in a subsequent issue of the *Rhodesia Agricultural Journal*, if suitable.—Ed., *R.A.J.*]

Dates of Meetings of Farmers' Associations, Southern Rhodesia.

Name of Association.	Place of Meeting.	Secretary.	March.	April.
			1930	1930
Ayrshire—Sipolilo	Various farms	G. H. Cautherley	8	12
Banket Junction	Banket Hotel	A. M. Hutchinson	7	4
Beatrice District	Farmers' Hall, Beatrice	W. Krienke	27	24
Bindura	Bindura Farmers' Hall	W. E. Fricker	14	11
Bromley	Farmers' Hall, Bromley Siding	E. Taylor	5	2
Bubi	Queen's Mine	W. H. Perham	21	18
Bulawayo Landowners' and Farmers' Association	Library Buildings, Bulawayo	T. B. Hepburn	4	1
Chakari	Various farms	Lady Codrington	19	16
Daisyfield	Somabula (March), Daisyfield (April)	L. E. Edwards	8	19
Darwendale—Trelawney	Various farms	Charles H. Tanner	26	23
Eastern Districts	Farmers' Hall, Chidza	W. E. Richards	8	12
Enkeldoorn	Enkeldoorn	C. N. Ludlowe	4	1
Enterprise	Farmers' Hall	W. Stobart	4	1
Essexvale	Essexvale	Col. D. Judson	16	20
Felixburg—Gutu	Makowries (April)	E. C. Fleetwood	...	12
Figtree Branch, R.L. and F.A.	Figtree Hotel	The Secretary	4	1
Gadzema	Gadzema Hotel	H. G. M. Liddell	14	11
Gatooma	Speck's Hotel	Col. J. A. Smith	15	19
Gatooma (Golden Valley Branch)	Golden Valley Hotel	C. K. James	8	12
Gazaland (South Melsetter)	Farmers' Hall, Chipinga	J. Ward	15	19
Greystone	Quarrie Farm	P. J. van der Walt	8	...
Gwanda	Lowenthal's Building, Gwanda	N. J. B. Nilson	15	19
Hartley	Hartley Hotel	Mrs. F. C. Watson	8	12
Headlands	Headlands	J. A. Eve	...	...
Hunter's Road	Hunter's Road	R. W. Twilley	29	26
Insiza South	Farm Lancaster	J. Campbell	...	10
Inyazura	Inyazura	W. P. Frudd	...	4
Lalapansi	Lalapansi	B. J. Ingle	8	12
Lomagundi	Sinoia	F. W. Robertson	...	11
Lomagundi West	Various farms	A. A. Bisset	9	13
Macheke	Farmers' Hall, Macheke	R. O. Jackson	...	...

Macheke Valley (Headlands) Farmers' and Tobacco Growers' Association	Various Farms	T. R. Colam	1	5
Makwiro	Makwiro	W. L. Parsons	21	18
Marandellas	Marandellas Farmers' Hall	E. Cruikshank	7	4
Marandellas, Southern	Various farms	B. V. Cherry	5	2
Mashonaland	Mashonaland Farmers' Hall, Salisbury	P. Wilson	14	11
Matobo South	Farmers' Hall, Malundi Farm	A. G. Allan	15	19
Matopo Branch, R.L. and F.A.	Farmers' Hall, Malundi	W. Mirtle	15	19
Mazoe (Concession)	Various farms	Douglas Southey	14	11
Mazoe (Glendale)	Farmers' Hall, Glendale	James S. Brown	12	9
Melsetter	Court House, Melsetter	J. C. Kruger	13	10
Midlands Farmers and Stockowners	Royal Hotel, Gwelo	T. R. van Rooyen	12	9
Ngezi-Umniati	Harvieston, Enkeldoorn	Miss Harvie	29	26
North Umniati	———	J. F. Eagar	Not	received
Norton and Lydiate District	Norton	A. Jones	7	4
Nyamandhlovu	Nyamandhlovu	R. D. McLean	...	...
Odzi District Farmers	Odzi Hotel	M. Goldberg	1	5
Poorte Valley	Various places	A. D. Wilson	15	19
Que Que	Offices of the Que Que Sanitary Board	A. A. Ackerman	15	19
Rusape Farmers' Association	Rusape	E. C. Harrington	1	5
Salisbury South	Various farms	P. Linton	26	30
Selukwe	The Hotel, Selukwe	W. T. Simpson	...	...
Shamva	Shamva Court House	J. R. Trevor	21	18
Shamva North	Various farms	Mrs. E. J. Stevenson	14	19
Two Rivers Farming Association	Various farms	W. L. Parsons	15	19
Umboe (Branch of Lomagundi F.A.)	Various farms	G. T. Gover	8	12
Umvukwe Farmers' and Tobacco Growers' Association	Various ranches	———	8	12
Umtali	Drill Hall, Umtali	A. Howat	6	3
Umvuma and District	Umvuma	S. T. Montgomery	Not	received
Victoria	Victoria	G. E. Lamb	1	5
Wankie District	———	F. H. Going	Not	received
West Umvukwe Farmers' Association	Various farms	G. H. Gordon	1	5
Western	Plumtree Hotel	The Secretary	8	12
Willoughbys	Willoughbys	A. E. Roberts	Not	received

Export of Cattle from Southern Rhodesia, 1930.

Month	Union		England.	Congo		N. Rhodesia	Portuguese East Africa.			Total
	Slaughter		Slaughter							
	Johannesburg	I.C.S. for overseas	On hoof	Slaughter	Breeding	Breeding	Slaughter	Trek	Breeding	
January ...	...	...	...	2,449	67	...	...	...	...	2,516
February ...										
March ...										
April ...										
May ...										
June ...										
July ...										
August ...										
September ...										
October ...										
November ...										
December ...										
	...	...	...	2,449	67	...	...	...	...	2,516

Southern Rhodesia Veterinary Report.

December, 1929.

AFRICAN COAST FEVER.

No cases occurred during the month under review.

TRYPANOSOMIASIS.

Eight cases in the Golden Valley, Gatooma; one case in Lomagundi, and five cases in the Melsetter district.

QUARTER-EVIL.

Few cases reported. In most cases owners inoculate on the appearance of the disease, and the mortality in consequence is small.

CUTANEOUS MYIASIS (SCREW WORM) OF CATTLE.

Prevalent in most districts, owing to the increased activity of the bont-legged tick.

HEARTWATER.

A number of cases have occurred in the southern portions of the Gwanda and Matobo districts.

SWEATING SICKNESS IN CALVES.

Cases are reported with only slight mortality.

HORSE-SICKNESS.

No cases reported.

IMPORTATIONS.

From the Union of South Africa.—Bulls 11, heifers 39, horses 5, sheep 2,088, donkeys 4.

EXPORTATIONS (CATTLE).

To the Union of South Africa.—For local consumption 31. To Belgian Congo.—Slaughter 2,586, breeding 69. To Northern Rhodesia.—Breeding 6.

EXPORTATIONS (MISCELLANEOUS).

To the Union of South Africa.—Goats 114. To Northern Rhodesia.—Sheep 224, goats 48. To Belgian Congo.—Pigs 90. To Portuguese East Africa.—Sheep 30, goats 30.

COLD STORAGE EXPORTS TO THE CONGO.

Beef.—Carcases 84, livers 40, tails 30, hearts 80, tongues 80, brains 71, cheeks 160. Calves.—Carcases 30, heads 17, trotters 22, plucks 10, tongues 45, brains 30. Pigs.—Carcases 40.

COLD STORAGE EXPORTS TO NORTHERN RHODESIA.

Beef.—Carcases 79.

G. C. HOOPER-SHARPE,
Acting Chief Veterinary Surgeon.

Seeds for Sale, Gwebi Farm.

		s.	d.
Boer Manna	per lb.	0	4
Napier Fodder Roots	per bag	6	0
Edible Canna	per 100 "tubers"	9	0

All prices quoted are for *delivery free at any station or siding* in Southern Rhodesia. Before sending cheques, intending purchasers are advised to ascertain that the seeds, etc., required are still available. Cheques should be made payable to "Gwebi Farm." All orders and enquiries should be addressed to the Chief Agriculturist, Department of Agriculture, Salisbury, *not direct to the Gwebi Farm.*

Farming Calendar.

March.

BEE-KEEPING.

As the latter end of this month should herald the approach of the second and last real honey flow of the season, see that enough extra supers are ready for placing on hives as required, watching also that the fully drawn out combs of shallow frames that are on hand to fill them with are kept free from the wax moth; further, examine all supers that are already on the hives for this serious defect, though strong colonies will as a rule keep the combs free from this pest. March being usually a hot month, look well to the entrance; enlarge when and where necessary, and have ventilating lids on the tops of each hive. Extra ventilation can be provided for when required by placing small metal or wooden wedges underneath the top super, but not to be open enough to let out or in a single bee. Where quilts are noticed to have been eaten or more or less destroyed during the summer months, now is the time to make fresh ones so as to be ready for the closing down and the making snug of each hive when winter approaches; old flour bags or old deck chair canvas make capital quilts. Bees during this month will consume a quantity of water; see that some is always kept in the apiary in floating cork chips. This will save much labour and flight for them, as well as prolong their period of work and usefulness. As stated in last month's notes, flying swarms may be expected now any day, so prepare for their capture if required by having all details and items ready for immediate use. It is as well, however, at this date of the season to do without such swarms, unless the owner is prepared to feed them well during the winter months. March or April swarms, unless they are hived under conditions of providing all the frames, of fully drawn out old combs, do not as a rule have either the time or materials to provide for a strong colony before the winter sets in, and must perforce remain a weak one during that period. The axiom of every bee-keeper should be to let his colonies go into winter quarters brimming over with bees, not only to provide against the mortality that is bound to occur then, but to have a full hive to start the next season with.

CITRUS FRUITS.

Two thorough sprayings about this season, when the rains are usually practically over, at an interval of about two weeks, will often obviate the necessity for further work against scale insects until the beginning of the next wet season. If not already done, orchards should be ploughed and cross-ploughed and worked up into a really good surface, so that the cultivators can be kept going, say, every two weeks until it is necessary to irrigate, after which cultivation should be continued. If March prove a dry month, orange trees holding up a crop of fruit will probably require irrigation, but under normal weather conditions it should not be necessary. The same remarks apply as last month with regard to fruit moths. About the end of this month fall budding can be taken in hand, that is the insertion of buds that are intended to remain dormant until spring. This applies to higher altitudes, but in low country, where the growing season is extended, dormant budding should not be done until latter end of April.

CROPS.

Watch oats for rust, and, if badly infested, cut crop for hay as soon as weather permits. Ridge late potatoes, and if weather is dry prevent ridges from cracking, to check tuber moth infestation. Finish ploughing under all green manure crops while the ground is still moist enough to promote rapid decomposition. Late in the month begin to cut silage crops and ensile. Cut out barren maize plants and feed to stock or ensile. Cut Sudan grass for hay to permit of final late growth for autumn grazing. Reap any crops that are ready, and plough the stubbles **at once.** Lift ground nuts that are sufficiently matured. Watch for ground nuts making second growth; reap, and when sufficiently dry, place in cocks with nuts inwards and cover the top securely. Sow onion seed beds for winter crop. Watch the weather for hay-making and take advantage of fine spells. Towards the end of the month hay-making should normally be in full swing. Continue to plough all lands in succession immediately the crops are reaped from them. Vleis and irrigable lands should now be ready, or in process of being prepared, for winter crops. Early sowings of Algerian oats, barley or rye for green forage can be made. Allow any potatoes lifted to dry before storing them, but do not leave too long in the sun. Destroy witch weed and other noxious weeds. Continue to make all the kraal manure possible by throwing grass and litter into kraals, yards, etc. Begin to select in the field maize plants for seed purposes, and mark them with slips of coloured cloth. Press on with the breaking up of any virgin land which may have been stumped or cleared earlier in the year. Place orders for grain bags without delay. Early in the month silage pits should be cleaned out or, where necessary, new pits dug.

DAIRYING.

This is usually the most favourable month of the year for dairy operations. Cooler nights are now in evidence, and there is usually little difficulty in maintaining a low temperature in the dairy and cheese-room. If elementary precautions are taken, all cream should be first grade, and first-class cheese should be made, as a gassy condition of the milk is rare. Dairy cows, unless they are very high producers, can go without extra rations, because the grass is now in seed and grazing is ample. The cheese storeroom is generally full of cheese, and care should be taken to turn the cheese regularly. The windows and doors should be opened at night and closed in the daytime. A little mould on the cheese will not affect its quality, but if the mould is excessive the cheese should be rubbed daily.

Calves which are under four months old should be kept in and allowed to nibble at well-got hay; at the same time a little dry mealie meal and monkey nut cake will do them good and teach them to eat concentrates. An ample supply of clean water should be provided in the calf run.

ENTOMOLOGICAL.

Maize.—The stalk borers of the second brood may now be found in the stalks, but nothing can be done at this stage. Caterpillars sometimes attack the crop as a sequel to cultivation after grass weeds have made too much growth. The caterpillars attack the crop on account of their more natural food being suddenly destroyed. Prevention and not cure is indicated.

Tobacco.—The crop will by this time mostly have outgrown insect injury, but leaf miners and budworms may be in evidence. The latter are usually destroyed by hand when topping. Any plants affected with stem borer should be removed and destroyed.

Potato.—If ladybird beetles or caterpillars are injurious, spray with arsenate of lead (powder) 1 lb. to 30 gallons of water. Careful hilling should be attended to with the object of preventing and checking tuber moth attack.

Vegetable Garden.—If sawfly attacks plants of the cabbage family dust with Paris green 1 lb., fine sifted slaked lime 20 lbs. Against cabbage louse (aphis) wash plants frequently with a strong spray of water. Destroy blister beetles by hand. Plants of the melon family may be baited regularly with arsenate of lead (powder) $1\frac{1}{2}$ ozs., treacle $\frac{1}{2}$ gallon (or cheapest sugar $2\frac{1}{2}$ lbs.), water 4 gallons, to keep down fruit flies. For leaf-eating caterpillars and beetles, etc., spray with arsenate of lead (powder) 1 lb. in 30 gallons of water on foliage which will retain water. Cabbages are best dusted.

Citrus Trees.—Collect and destroy infested fruit to keep down citrus codling. Fruit-piercing moths sometimes attack the fruit during the month, especially navels. They work at night and can only be dealt with at present by hand destruction. The trees should be watched for development of aphis and soft brown scale on the young growth and prompt measures taken. Resin wash at two-thirds standard strength is suitable.

Mosquitoes, House Flies, etc., may be very prevalent during March. Destroy breeding places. Poison or trap adult flies. Attend to screening of residence.

FLOWER GARDEN.

Flower seedlings for winter blooming should now be coming on, and should be planted out during showery or cloudy weather. Cuttings of carnations may now be made, and should be taken from selected plants which have borne the choicest blooms. The cuttings should be dibbled in half paraffin tins containing three parts sand to one of loam, and kept in a moist condition in a shady position sheltered from the winds. Make main sowing of winter-flowering sweet peas in a well-prepared and rich soil.

VEGETABLE GARDEN.

The sowing calendar is the same as that recommended for last month. Plant out from seed beds cabbage and cauliflower; care should be taken during this month, as the end of the rainy season approaches, to dig with a fork all the ground in the garden. The heavy rains settle this down hard, and as soon as the dry weather begins the soil cracks and lets out all the sub-soil moisture by evaporation. As soon as the rains cease entirely it is advisable to go over the ground and fine down with a rake, leaving some three or four inches of quite fine soil to act as an earth mulch.

FORESTRY.

Cultivation where necessary should be undertaken between the rows of trees planted out in previous months. If cultivation is carried out with the hoe, care should be taken not to pile earth round the base of the stems. New ground for next season's planting should be roughly broken up with the plough. Bulk plantings may be proceeded with during the month.

GENERAL.

At this time the condition of stock on the veld is usually good. It is well, however, to look ahead and make ready for the coming winter by the provision of winter feed in such forms as veld hay, silage, baled fodder from maize, manna, oats, teff, velvet beans, and the like, and by taking steps to ensure that water will be available for the stock in winter as near their grazing ground as may be.

POULTRY.

The breeding pens should have all been mated up by now, as the first chicks should be out by the beginning of April. Much more care should be used than is usually the case when selecting birds for breeding. Only the very best, i.e., the strong, healthy, vigorous ones from the best layers, should be chosen. A pamphlet on "Selection and Mating for Improvement" can be obtained on application to the Editor or the Poultry Experts. This deals fully with the subject. Always keep an eye on the male bird; many are apt to get thin and run down in health, due to their allowing

their mates to eat all the food. Such birds are better breeders than those that chase their mates away from the food. Every male that is being bred from should be given a good meal by himself each day, to ensure health and vigour. The incubator should be thoroughly overhauled, cleaned and disinfected before the eggs are put in.

STOCK.

Cattle.—The precautions recommended for February apply equally to March. Arrangements should be completed for storing as much silage as it is proposed to make, so that the crops reserved for this purpose may be harvested immediately they are ready.

Sheep.—The same precautions as for February should be taken, but as less rain may be expected, conditions will probably be more favourable. If late winter lambs are not desired, the rams should be removed from the flock.

TOBACCO.

All late plants should be topped low to hasten maturity. The bales of cured leaf should be examined to ascertain whether or not the tobacco has been baled in proper condition. Seed heads should receive continued care. Land ploughed during February should be disced and rolled to assist the decomposition of organic matter. Tobacco fields already cleared of plants should be immediately ploughed. Tobacco bulks should be examined and turned, if necessary.

WEATHER.

Rains may be looked for in considerable quantity, though less than in previous months, 5 inches in Mashonaland and 3 inches in Matabeleland being normal, with as usual more on the eastern frontier. No useful rain need be reckoned upon after the end of this month, except on the eastern border, but the rainy season tapers off in an irregular and often erratic manner and without certainty.

April.

BEE-KEEPING.

The notes given for last month will in the main apply to April also, according as to how the season develops. Last year, for instance, the honey flow in Northern Rhodesia was much protracted and the bees were busy storing until well on in May. New swarms are not recommended to be hived during this month unless they are supplied in the first instance with fully drawn out frames and the owner is prepared to feed them now and again during the winter. As April should be a very active month for the bees, watch carefully the progress of the crates in which surplus honey is being stored, and have plenty of frames—fully drawn out if possible—ready fixed with foundation so as to place on extra crates as occasion may require; these should be placed under the full or filling one and not on the top, as might appear the case. For the benefit of those who would like a little honeycomb, it might be stated that if two or three shallow frames are fitted with four empty comb sections, and placed in the crate, the bees will take to this plan and so provide both comb and honey for extraction in the one crate. In this African climate full crates can be left on the hive with safety until ready for extraction, but if any are taken off they must be watched now and again until they are extracted for damages from the wax moth, which in a day or so can ruin both the comb and honey. Will apiarists this month take particular note as to any Sunn hemp crop they may have? This plant may be rich in nectar, and much valuable information might be obtained if this is the case, as the crop is being planted on an increasing scale.

CITRUS FRUITS.

During the first half of this month, autumn budding can still be performed if the sap is still up and the bark of the stock slips freely. Unprofitable and off type trees that have been headed back for top working and which have been carefully thinned out may have the shoots on which February-March buds have failed re-budded to profitable varieties. If the March rains have been sufficient and ploughing and cultivation have been completed, continue cultivation to retain soil moisture and destroy winter weeds. If a dry March has been experienced and cultivation has been badly performed, irrigation should be commenced or continued to keep the trees and fruit in good order. If not already applied to the unthrifty trees which are late with their autumn flush, soluble fertilisers containing nitrogen and phosphoric oxide can be applied with advantage to these trees. The fertiliser should be worked into the soil with a cultivator and followed up with an irrigation. Exporters should have everything in readiness for packing the early fruit, which should be fit to market about the end of the month. Scale infested fruit will be unfit for export unless treated at once. See entomological notes for treatment.

CROPS.

If sufficiently mature, begin cutting and stooking early maize over a small acreage and plough up the ground whilst still damp between the rows of stooks. If ripe, reap and husk early planted maize, and keep in a separate dump. Continue to make field selections of the best maize plants, and mark those required for seed with strips of coloured cloth. Lift any ground nuts and potatoes showing signs of making second growth. Make silage; cut maize for this when the ears are in the "dough" stage. Pick up and stook maize plants blown over to protect the ears from white ants. Feed sweet potato vines to stock, reserving any new growth of vines for feeding as grazing in May. Plough in any green manure crops not already turned under. Plough fallowed land. Keep potatoes reserved for seed on racks in a cool place protected from frost, but well ventilated. Transplant onions from seed-beds to irrigated or naturally moist lands; irrigate about once a week, but do not apply too much water. Pick over potatoes which may be lifted, and remove the bad and diseased ones. Winter cereal crops for grain can be sown towards the end of the month. Cart manure to the lands. Remember that good and deep ploughing to a depth of at least 7 to 8 inches is essential, and the basis of all successful arable farming. If the lands are not already ploughed so deep, increase the depth of ploughing about an inch a year until this depth, or even more, is reached. On lands which have been ploughed for a number of years at the same depth, use a grubber to stir up the sub-soil without lifting it to the surface. Too much attention cannot be paid to good tillage. It is usually good practice to follow the plough at once with a harrow or other suitable implement to break down the clods before they bake hard. Continue breaking up new lands; the earlier this is done the more complete is the decomposition of the vegetable matter in the soil. When making hay of coarse legumes such as velvet and dolichos beans and cowpeas, be sure that the vines are dry before stacking. Handle the hay as little as possible to avoid loss of leaf. Thought should be given to laying in supplies of thatching grass for thatching and repairing roofs. The veld may be beginning to dry off. Consideration may be given to mowing or otherwise preparing fire lines as a preventive against veld fires.

DAIRYING.

At this season of the year the milking kraal is generally far from clean owing to the excessive amount of mud or dust which has accumulated during the latter part of the rainy season, and in consequence farmers invariably have trouble in producng first-grade cream. Every endeavour should be made to erect a small milking shed in which four or five cows or more can be milked at a time, and every effort should be made to keep the cows clean. The udders should be wiped

before milking with a clean, damp cloth, and the farmer should see that the natives' hands are washed with soap and clean water before and after each milking.

If butter is made, the cream and washing water should be put out overnight, and if the cream is churned early the following morning, very little difficulty should be experienced in obtaining a good grain and a firm body in the butter.

From this time of the year onwards, cheese making operations are usually most successful. The evening's milk should not be kept in the dairy, but should be placed outside, preferably in a bath, and covered over with butter muslin, cheese cloth or mosquito gauze netting. Care should always be exercised, however, in using evening's milk. Morning's milk plus a starter usually gives the best quality, and if a starter is used, care should be taken that it shows no signs of gasiness or off flavours.

The season of abundant green pasture is over, and the natural grazing, unless supplemented by some green food or succulent roughage, is not sufficient to maintain a full flow of milk. The most economical supplement to veld grazing at this time is maize silage, and this should be fed in liberal quantities to all milking cows and growing stock. A few pounds of concentrates in addition would also be of great benefit to the milking cows, which should not be compelled to subsist entirely on veld hay and silage.

DECIDUOUS FRUITS.

If not already done, orchards should be ploughed, harrowed and well cultivated to retain the soil moisture for spring blossoming and growth. Varieties such as the Chinese peaches, etc., may be pruned after the leaves have dropped.

Order all trees for winter planting during June-July. August planting is unsafe for many early growing varieties of fruits.

All late apples should be harvested and stored or marketed.

ENTOMOLOGICAL.

Maize.—Although certain pests, such as earworm and stalk borer, may be in evidence, there are practically no operations against insect pests that can be carried out economically during this month.

Tobacco.—Any remaining plants showing stem borer attack should be removed and burnt. Watch should be kept for emergence of the adult wire worm beetle. These should be poisoned with Paris green in the proportion of 1 lb. to 200 lbs. of maize meal. The bait should be spread on the land in small heaps early in the morning and shaded from the sun.

Cotton.—Damage to bolls from bollworms may be betrayed by the dropping of the bolls attacked. These should be collected and burnt. Cotton stainers should be destroyed by hand collecting. Guinea fowl, turkeys, etc., may be encouraged about the land to destroy stainers and other insects.

Citrus.—Collect and destroy infested fruit to keep down citrus codling moth. Red scale should be destroyed by fumigation with hydrocyanic acid gas. Soft brown scale may be controlled by spraying with resin wash. If unseasonable young growth appears, aphis may develop and must be kept suppressed to prevent soiling of the fruit with black fungus.

Vegetable Garden.—Plants of the cabbage family are liable to suffer severely from cabbage louse and Bagrada bug. The former can be kept largely suppressed by frequent washings with a strong spray of cold water. Bagrada bug is difficult to fight, but carbolic emulsion and resin wash have been recommended as sprays elsewhere. These washes must be applied directly to the insects, and the immature stages are more readily killed than the adults.

Potatoes should be cultivated systematically and hilled to keep the tuber moth from the tubers.

FLOWER GARDEN.

The garden can generally be depended upon to make a good show in the autumn and early winter, provided that the plants have been previously kept in a healthy condition by watering, mulching and feeding. Snap dragons and other seedlings, also cuttings, may now be planted out into their permanent positions. Sowing may be made of hardy annuals, such as hollyhocks, larkspur, clarkia, pansy, petunia, sweet peas, gaillardia and candytuft. Bulbs of spring flowering plants may be taken up, divided and replanted.

VEGETABLE GARDEN.

Sow at once all that is required to fill up the vegetable garden before the soil has parted with all moisture. Seeds sown now will germinate freely, and plants will establish themselves more quickly than during the colder weather, which can soon be expected. A start should now be made at cleaning asparagus beds. This is a most popular vegetable, and yet one rarely sees it cultivated in the ordinary Rhodesian garden. It is supposed to be difficult to grow, but this supposition is not borne out, as, once established, a bed of asparagus is one of the most easily managed vegetables in the whole garden. Depth of good soil and plenty of manure are all that this plant requires. Rhubarb roots may be taken up, divided and replanted this month. Plant out from seed beds cabbage and onion plants into their permanent quarters. Sow a full crop of peas, broad beans, turnips, onions, lettuce and radish.

FORESTRY.

Cultivate the soil in the young plantations either by means of machines or hand labour. The cultivation will conserve moisture. Hoed out weed growth should be applied as a mulch round the base of each young tree. Be careful not to pile earth round the stems of the young trees. Covering the stems with earth even for an inch or two interferes with sap circulation and invites attacks by termites.

Prune the young trees to single stems. Any strong undesirable branch growth may be checked by breaking off the leading shoot.

POULTRY.

The first chicks should now be out, and these, having been hatched, must be well looked after. No food should be given for the first 36 to 48 hours. Leave them to sleep as much as possible. See that they have plenty of fresh warm air, but are not exposed to draughts. After 48 hours give some small grit and charcoal to purify the intestinal tract and aid digestion. A pamphlet dealing very fully with incubation and rearing of chickens can be obtained gratis on application to the Poultry Experts, Department of Agriculture.

One comes across many cases of wrong treatment of chickens in this country, the chief being uncleanliness, over-crowding, giving food too early and dirty drinking water. Two most important foods are animal protein, especially in the form of thick separated or whole milk and green food, especially onions or eschalots or their green tops. The loss in the rearing of chicks is very great; this should not be so if good breeding stock is used, the eggs from these are carefully handled and incubated and the chicks reared with care and common sense.

Any turkey chicks hatched at this time of the year should be well looked after. They should be kept warm, dry, free from insects, fed on dry food only, given plenty of thick separated milk, onions or onion tops, dry mash and grain. A pamphlet on turkeys and turkey rearing is obtainable gratis from the Poultry Experts.

Ducks should do well during the month, the weather being as a rule cool, moist and bracing; but the houses in which they sleep must not be

damp. Duck breeders should always be on the "qui vive" for a round worm called "Trichosoma contortum," which is often fatal to ducks. It is found in the œsophagus, and causes arrest of growth, emaciation and weakness and sometimes epileptiform attacks. A swelling will be noticed at the lower part of the neck, which rapidly increases in size, and death occurs in one to three days. Onions, or preferably garlic, mixed with the food is a good preventive and cure. Another good remedy is essence of turpentine mixed with twice its quantity of olive oil and one or two tablespoonfuls given for a dose.

TOBACCO.

The grading of the brighter grades should be proceeded with as soon as convenient. All leaf which has cured green should be bulked separately and be regularly examined to avoid serious damage through overheating. Tobacco seed heads, when mature, should be removed from the plants and stored where no damage will occur through activities by rats and mice. Care should be taken to store these seed heads with the pods uppermost, as otherwise much seed may be lost. Clear and plough the land soon after the crop has been harvested. Burn old stalks as a control measure against possible carry over of disease.

Departmental Bulletins.

The following Bulletins, consisting of reprints of articles which have appeared in this Journal, are available for distribution free of charge to applicants in Southern Rhodesia only. Outside Southern Rhodesia, 3d. per copy.

AGRICULTURE AND CROPS.

No. 174. Notes on Hop Growing, by H. G. Mundy, F.L.S.
No. 218. Useful Measurements for Maize, by J. A. T. Walters, B.A.
No. 225. Napier Fodder or Elephant Grass, by J. A. T. Walters, B.A.
No. 278. New Crops for Rhodesia, by J. A. T. Walters, B.A.
No. 362. The Cultivation of Rice, by H. G. Mundy, F.L.S.
No. 374. Fibre Crops, by J. A. T. Walters, B.A.
No. 403. Florida Beggar Weed, by H. G. Mundy, F.L.S.
No. 429. Propagation of Kudzu Vine, by H. C. Arnold.
No. 442. Swamp or Irrigation Rice, by K. V. Yoshi, Bombay.
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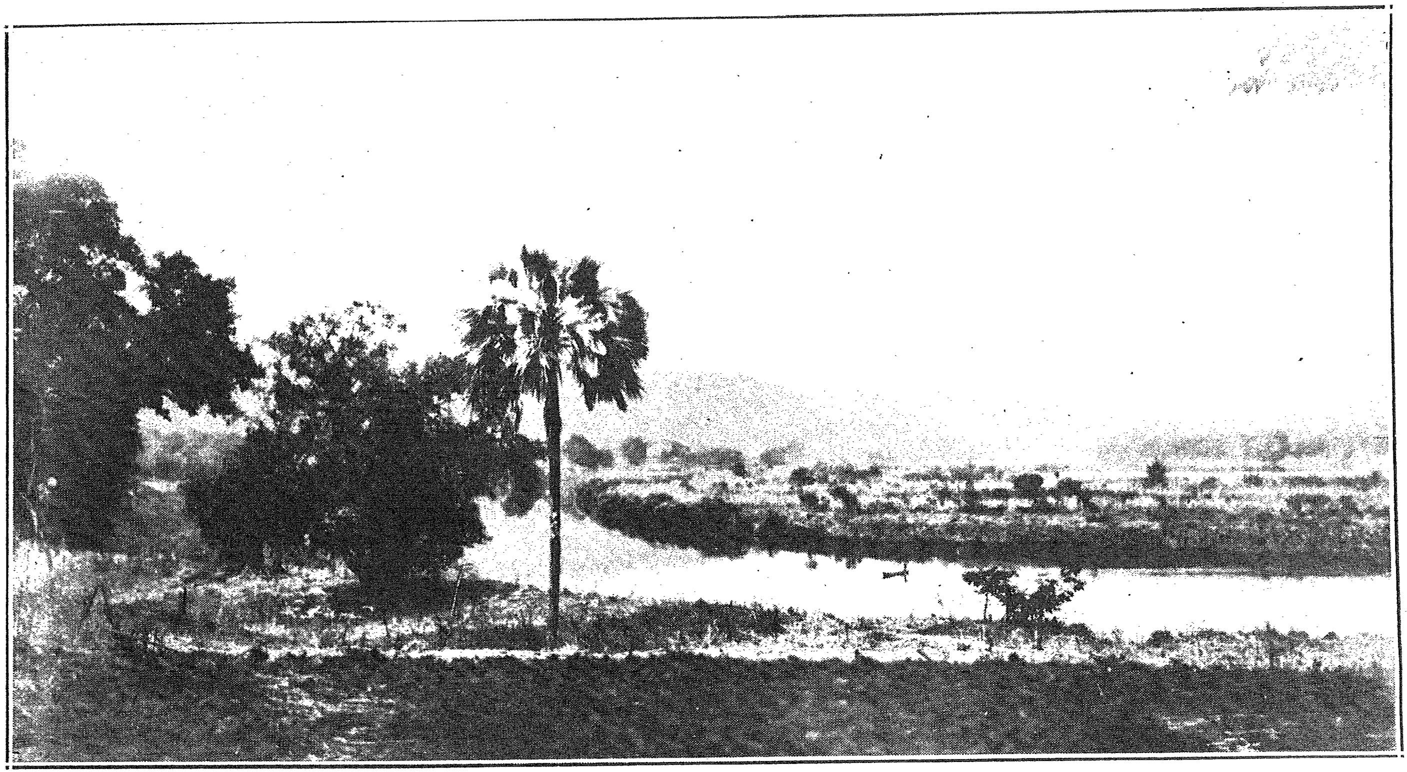

The Zambesi River at Tshete, about 150 miles below the Falls.

[Photo by H. W. D. Longden.]

THE RHODESIA

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Editorial.

Contributions and correspondence regarding subjects affecting the farming industry of Southern Rhodesia are invited. All communications regarding these matters and advertisements should be addressed to:—The Editor, Department of Agriculture, Salisbury.

Marketing of Rhodesian Fruits.—As a result of the meeting held on the 13th March, to which reference was made in the last issue of this Journal, arrangements are proceeding to open a depot in Salisbury for the receiving and orderly distributing of Rhodesian-grown fruit. A company entitled the Co-operative Fruit Depot (Rhodesia), Ltd., is being formed with a capital of £1,000, of which it is proposed to issue five hundred £1 shares fully paid at once, the minimum holding to be two shares. It was decided by the meeting referred to that business should be conducted on a wholesale basis, and the depot will therefore receive the fruit of members and pass it on to the retailers, who will sell it at a reasonable figure. It is hoped to open the depot on the 1st May.

Growers who are desirous of becoming shareholders should communicate with the Horticulturist, Department of

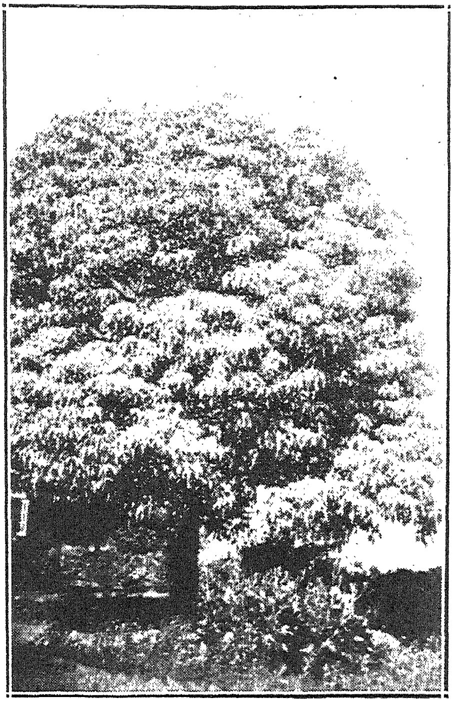
Agriculture, Salisbury, who will place their names before the board. Members are requested to notify the Horticulturist of the quantities of fruit they expect to have available during the present year.

The Candle-Nut Tree (*Aleurites Triloba*).—This tree is closely allied to the species Aleurites fordii and Aleurites montana (tung oil trees), about which considerable interest has arisen in the Colony recently. The tree shown in the illustration is growing in Salisbury, and so far as is known there is only one other in the Colony. Results obtained in attempts to propagate local seed unfortunately have met with very little success, but once established, the tree will undoubtedly thrive and be a valuable addition to the shade trees of the Colony. The tree bears a large crop of nuts, which are edible and not unlike the Brazil nut in flavour.

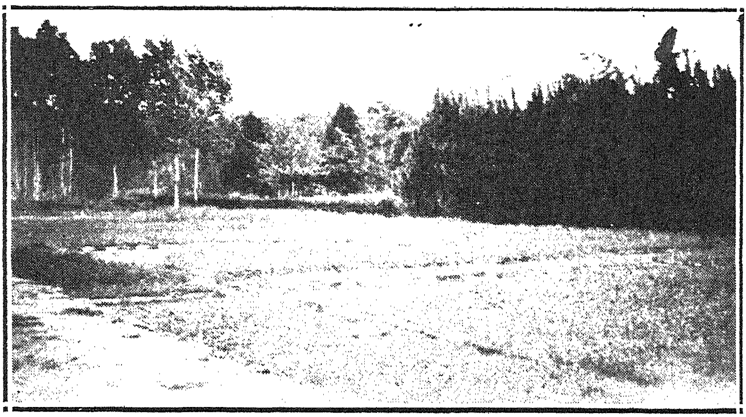
The allied species tung oil trees mentioned above are being tested widely throughout the Colony, and although results to date show that the trees will grow, they do not indicate that they will flourish sufficiently to make the growing of them a commercial proposition. It is hoped, however, that further experiments will show that these valuable trees will flourish in the high veld with a rainfall over 35 inches.

It is interesting to note that some time ago the Imperial Institute set up a tung oil sub-committee to foster Empire production of the oil, and grants-in-aid have been made by the Empire Marketing Board. Experimental cultivation trials which are in progress in twelve of the Dominions and Colonies have already shown that tung oil does exceedingly well in many parts of the Empire. Experiments in Kenya in particular indicate that this Colony is ideally suited to the growth of the tree. In New South Wales there are about 1,000 trees under plantation yielding satisfactory oil.

Forestry in Southern Rhodesia.—The illustration on the opposite page shows a corner of the Forest Nursery, which is situated on the outskirts of Salisbury. The nursery was



The Candle-Nut Tree, growing in a garden in Salisbury.



A corner of the Forest Nursery, Salisbury.

established in 1903 and is maintained for the distribution of seed, the raising of seedlings, transplants of forest trees and ornamental plants. These are sold to the public, and a full list of those available can be obtained upon application to the Forest Officer, Department of Agriculture, Salisbury, or the Editor of this Journal. The public are invited to visit the nursery, and, where desired, advice and demonstrations will be given by the nurseryman in charge on the principles of nursery practice. During the past year the number of visitors totalled 875. The nursery is primarily maintained by the Government for the benefit of the public, and it is largely owing to this nursery that the beautiful gardens and wooded surroundings of Salisbury may be attributed.

Loans to Farmers for Conservation of Water.—Reference was made in the *Rhodesia Agricultural Journal* for July, 1929, to an amount of £10,000 which had been provided by Government for the purpose of granting loans to farmers to enable them to construct works for the conservation and utilisation of water to be used for irrigation and other purposes. It will be remembered that regulations governing the granting of these loans were published in the *Government Gazette* of 7th June, 1929, and are in accordance with the terms of the sections of the "Water Act, 1927," which provide for such loans.

It was not considered that there would be any great demand in the first year of operation, as the investigation of schemes in respect of which loans would be applied for must take some time. Actually twenty applications for irrigation loans were received up to the end of 1929, of which thirteen have been sanctioned, three are waiting sanction and four have been refused. Of the twenty applications received, eleven were for repayment of boring charges, seven for loans for construction of irrigation works and two for small erosion protection works. The loans sanctioned amount to a total of £2,000, and the requests for loans still awaiting sanction total a further £2,000.

It is anticipated that there will be a bigger demand for these loans during the present year, when the facilities available become more generally known.

Plant Diseases in Southern Rhodesia.—Readers will observe that we are publishing in this issue of the Journal—towards the end—the first part of a list of plant diseases which are known to occur in this Colony. The list makes solid reading and the question may be asked why, contrary to our practice, we inflict such matter upon readers. It is necessary, therefore, to explain the reason for the innovation.

A recommendation was made at the Imperial Agricultural Conference held in London in 1927 that lists of plant diseases occurring in different parts of the Empire, particularly tropical colonies, should be compiled and distributed to the various departments and institutions engaged in mycological work. In time lists will be published by other dependencies (one has been received from Kenya) which will be sent to this Colony, so that we shall know, for one thing, what diseases are likely to be of importance if introduced into Rhodesia and also what diseases are likely to be dangerous to newly introduced crops. At present such information is widely scattered in literature and not readily available for the working mycologist.

The list is long, but will be published in parts so as not to obtrude too much on the space available in the Journal; but it must be remembered that one of the obligations of the Journal is to supply information to other colonies, which may in turn be expected to assist in the solutions of problems of local interest. The list is therefore a contribution to the promotion of co-ordinated plant disease control work throughout the Empire.

In conclusion we might state that although the list is not likely to appeal to many readers, yet there are some who are interested in such matters, and it is the farmers themselves who will, in the end, benefit from the interchange of information of scientific importance between various countries.

Cotton in Southern Rhodesia.—The Honourable R. A. Fletcher, Minister of Agriculture and Lands, has written the following as an introductory note to the report on the work of the Cotton Breeding Station, Gatooma, for the season 1927-28:—

There are few Votes on our Annual Estimates of Expenditure that afford me more satisfaction in approving than that which provides for the Plant Breeding Station and Cotton Seed Farm at Gatooma, where Major Cameron and his staff of keen and industrious officers are carrying on such useful work in the interests of our agricultural industry.

Rhodesia, being a young country, is ever on the look-out for fresh avenues for agricultural development, and in the past has at times, I am afraid, embarked on new crop-growing ventures with more enthusiasm and enterprise than perhaps prudence would have dictated. The cotton-growing boom was one of these occasions, and the crop might well have been permanently turned down in the reactionary spirit of disappointment which followed, but for the good services of the Empire Cotton Growing Corporation. Unobtrusively and methodically have the plant-breeding experiments been carried on from season to season at the Gatooma station, while interest in cotton as a crop has been kept alive by co-operation with a few progressive growers until ultimately suitable resistant strains have been evolved and seed production developed. Major Cameron, always hopeful and encouraging, is now sounding a more optimistic note. He believes that he and his staff have achieved a measure of success and that the industry is on the eve of being launched on a commercial scale. This is very welcome news, and nowhere more welcome than with the Government. It comes at a most opportune time. Not only do we now see hope in cotton as a much-needed rotation crop in the economic scheme of many of our farms, but there are possibilities of it taking its place as the most marketable "money crop" that can be developed on others.

I am glad to be able, on behalf of the Government, to associate myself with this work, and would like to congratulate Major Cameron and his associates on the progress that has been made. Complete and unqualified success is a reward which seldom if ever comes in our human struggles, but genuine purposeful work has always its own great value on the credit side of any honest endeavour.

The Report.—Work at the Gatooma Cotton Breeding Station during the year under review was directed mainly towards improving the U. 4 type, which had in the previous season demonstrated its resistance to jassid and had given promise of yielding a cotton of good commercial value. Despite unfavourable climatic conditions and a severe attack of American bollworm, important results were obtained, and it was possible to issue 10-lb. packets of U. 4 Special Bulk to 124 growers for seed plots this season. The greatest obstacle to complete success appears now to be the possibility of serious bollworm infestation in any one year, and this calls forth the following comment from Major G. S. Cameron, who has written a foreword to the report:—

"The absence of severe bollworm attacks in the past tended to lull one into a false sense of security. To know, as we now do, that attacks of American bollworm may occur with a frequency yet to be experienced will tend to concentration in the selection of still more prolific and earlier maturing strains. That such strains exist is clearly demonstrated in the report. That they can be rapidly multiplied and brought into general distribution throughout the Colony, through the co-operation of the more progressive growers, is now no longer a matter of speculation."

It is encouraging to observe that U. 4 selections again proved completely outstanding compared with the other strains and varieties grown on the station and throughout the Colony. Brokers' reports were obtained on samples of U. 4 grown during the season 1927-28, and these on the whole are satisfactory. It is stated that the staple was given as a good 1 1-8 ins. to 1 3-16 ins., medium in strength, rough, wanting in fineness to moderately lustrous. The yields as recorded in the tables appear to be quite satisfactory.

It is reported that not one of the strains other than U. 4 gave satisfactory results, although 105 selections from Bancroft, A. 12, Zululand Hybrid and Cambodia were planted out. It is interesting to note that in all some 180 U. 4 re-selections are being carried on.

From what is written it is evident that the hope of the future lies with U. 4, and we are encouraged to think that the plant breeders at Gatooma will before long produce a strain which will meet most of our requirements and make

it possible to grow cotton in Southern Rhodesia on a more extensive scale.

Included in the volume kindly sent us by the Empire Cotton Growing Corporation are reports from stations in Australia, Africa, Swaziland, Southern and Northern Rhodesia, Anglo-Egyptian Sudan, Uganda, Nyasaland, Nigeria and Fiji, showing the extent of the endeavour to render the Empire independent of foreign cotton. The task is a gigantic one, and there are many difficulties to overcome, but encouraging progress is being made, sufficient to induce the belief that ultimately the object will be achieved.

In conclusion, we wish to express our appreciation of the excellent report which Mr. J. E. Peat has presented of the work at the Gatooma station.

Water Boring.—The annual report of the Irrigation Engineer for the year 1929 shows that no addition was made last year to the number of drilling machines employed by Government, and the full strength remained at a total of thirteen. The percentage of successes was practically the same as that of previous years, and can be regarded as very satisfactory considering the very difficult nature of the geological formations encountered in this Colony. The only unsatisfactory area exploited during last year was in the native purchase area in the southern portion of Gwanda district, where only two successful supplies have been developed in the ten boreholes sunk. It is intended to put down a trial borehole about 250 feet deep in this area to determine whether supplies are available at depth.

The average cost per foot in 1929 of all boreholes, including those in native reserves, was 23s. 5d., which is 3s. 6d. per foot less than the cost in 1928. This cheapening in the cost is mainly due to the fact that costs in the native reserves for boring have been reduced from 27s. 2d. to 21s. 5d. owing to the easier nature of the formations drilled through this year, also to the fact that drills were readily available in the various districts, thus enabling the work for private applicants to be undertaken with a minimum amount of expense for railage and transport charges.

It is of interest to note that during the last five years 15,100 feet have been drilled for private applicants at an average cost of 18s. 10d. per foot. This low cost compares more than favourably with the cost of well sinking when it is considered that the cost of casing is included and that boreholes are put down to depth in all formations and much larger and more permanent supplies of water developed than is usually the case in wells.

A Distinguished Visitor.—The Colony has had a distinguished visitor during the past six weeks in the person of Mr. Christopher Turnor, a member of the Overseas Settlement Committee in London and an authority on agricultural matters generally. Mr. Turnor has travelled to Rhodesia from the Cape by motor caravan, and has made a close inspection and study of agricultural conditions during his sojourn in South Africa and this Colony. It is pleasing to learn from Mr. Turnor that he is greatly impressed with our agricultural and pastoral possibilities. He was made aware shortly after crossing into Southern Rhodesia that the agricultural industry is passing through a period of depression and that settlement is not proceeding at the rate hoped for. He realises that our principal difficulty is one of marketing, and in an address which he gave at the Town House, Salisbury, he emphasised the urgent necessity of co-ordinated action by all concerned. He is a staunch advocate of co-operation and sees in its general adoption the only means of farmers getting an adequate price for their produce. He set his face against any measure of compulsion to obtain co-operation, but considered that if circumstances demanded it compulsory pooling of produce for sale should be legalised. He stressed in the most emphatic manner the importance of the agricultural industry to a young country such as Southern Rhodesia, and indicated that in his opinion drastic measures were warranted to place the industry on a sound basis. Mr. Turnor instanced easy and unlimited credit as an evil, and suggested a considerable tightening up of the practice in this respect. He thought that co-ordination between the Land Bank, the two principal banks, the commercial community and the farmers would be for the common good. He considered that every

application to the banks for credit should be subjected to the closest scrutiny before a loan was granted, and that subsequently there should be inspection to see that the money was well spent on the objects for which it was provided. Control of acreages with accurate marketing information was a condition precedent to successful farming in this Colony.

Dealing with land settlement—a subject with which he is intimately concerned and has wide experience—Mr. Turnor referred to the necessity for very careful selection in London of prospective settlers and rigorous elimination at this end of unsuitable persons. He favoured group settlement instead of pioneer or isolated settlement, and stressed the necessity for careful supervision by Departmental officers for the first few years. He considered that all settlers, before being accepted for assistance under the settlement scheme, should agree to three primary conditions, namely: (a) To crop the land in accordance with the direction of supervising officers; (b) to fertilise and green manure their soils under similar direction; and (c) to undertake to purchase or bring on to their farms no live stock other than that sanctioned by the supervisor. He also pronounced himself in favour of measures for the prevention of dumping, whether by licence, railway rates or protective tariffs. Mr. Turnor has visited every part of the Empire where settlement is proceeding on lines similar to those adopted in this Colony, and he stated that the percentage of settlers who had remained on the land here was greater on the whole than elsewhere. He regretted that it had been necessary to slow down settlement in this Colony, and agreed that in present circumstances the pace should not be forced. He hoped, however, that there would be no cessation of endeavour, and said that even if only a few settlers were placed on the land each month it was desirable. He instanced an increase in population of British type from overseas as one of our most pressing needs.

Mr. Turnor paid a high compliment to the work of the Department of Agriculture, referring in particular to the results obtained at the Salisbury Experiment Station and Gwebi Farm. He expressed the opinion very strongly that all farmers, and especially new settlers, should make themselves acquainted with the work in progress and should put

into practice the lessons to be learnt. He had observed instances of soil exhaustion in the Colony during his tour of farms, and stressed the value of green manuring in combination with the use of artificial fertilisers as a means of restoring fertility to the soil.

Mr. Turnor's address was listened to with the greatest interest, and it is to be regretted that it was not possible, owing to short notice, for more farmers to be present. His message was one of hope for the future and confidence in the ability of the farmers to overcome the difficulties with which they are at present faced.

Trade of the British Empire.—As a result of the Imperial Conference of 1926, the Imperial Economic Committee have been engaged on enquiries into the marketing within the United Kingdom of foodstuffs and raw materials produced within the Empire, and into the preparation for market of such foodstuffs and raw materials; in addition, they have been engaged on the preparation of world surveys of selected trades and industries.

In their enquiries into foodstuffs and raw materials the Committee have found it necessary to survey the extent and nature of the foreign competition which Empire producers have to meet in the United Kingdom market. In regard also to world surveys of trades and industries it is obvious that conditions outside the Empire have had to be reviewed. Consequently in both sections of the enquiries on which the Committee have been engaged they have had before them the extent and trend of competition between the Empire and foreign countries.

To enable them to obtain a broad view of the problem the secretary—Sir David Chadwick—has prepared for the use of the Committee a memorandum comparing the position of the Empire as a whole in world trade in 1913 and in 1925 to 1927 (with later figures where available for 1928), and also examining the relative importance and direction of inter-Imperial trade at those dates. The study aims at establishing no theory and is based solely on official trade returns and on publications issued by the Economic Section of the League of Nations.

The memorandum is divided into three parts: (1) The position of the British Empire in world trade; (2) the advance of the Empire overseas since 1913; and (3) the direction of inter-Imperial trade and the importance of Empire markets to Empire countries.

The enquiry elicits the fact that the world trade in 1927, recalculated at 1913 values, was 20 per cent. greater than in 1913. On this estimate the trade of the British Empire, taken as the aggregate of the imports and exports of its several parts and corrected for changes in price levels, had increased between 1913 and 1927 by about 27.5 per cent. In the two years 1927 and 1928 the rate of expansion was, however, somewhat slower than for the rest of the world. The aggregate of the imports and exports of the various parts of the British Empire represented nearly 30 per cent. of world trade in 1927. The value of the merchandise passing between Empire and foreign countries in 1927 was about three times that passing between Empire countries.

The memorandum shows that the advance of the Empire overseas since 1913 has been rapid. In 1927 and again in 1928 the total exports from the Empire overseas exceeded those from the United Kingdom by about 40 per cent., although in 1913 they were below them by some 7 per cent. In Canada and New Zealand exports in 1927 were, as compared with 1913, greater in volume by about 100 per cent. and 40 per cent. respectively, although concurrently the ratio of the prices of exports to the prices of imports in 1927 was above the corresponding ratio in 1913. These facts denote rapid progress. In Australia and South Africa the expansion in the volume in trade was about 10 and 18 per cent. respectively.

It is shown that the United Kingdom is the focus of inter-Imperial trade, of which in 1927 about 84 per cent. centred on the United Kingdom. In 1927 (trade with the Irish Free State being excluded) the United Kingdom imported and used about 40 per cent. more Empire produce than in 1913; the increase in the imports of foreign produce in the same period was about 15 per cent. Exports from the United Kingdom to the Empire overseas (excluding the Irish Free State) were about 9 per cent. less in volume in 1927 than in 1913; the decrease in volume of exports to foreign countries was in the same years about 30 per cent.

Veterinary Research in Southern Rhodesia.

REPORT OF THE DIRECTOR FOR THE YEAR 1929.

[Readers will notice that in this issue of the Journal the bi-monthly "Notes from the Veterinary Laboratory" have been substituted by the Annual Report, which is published almost *in extenso*. It is thought that the publication of this valuable report—which was presented to the Legislative Assembly on the 17th March—at the earliest possible date is most desirable, and we feel sure that stockmen and all associated with the live stock industry will read with great interest this record of the year's work.—Ed., *R.A.J.*]

LABORATORY PRODUCTS.

Vaccines, medicines and other Laboratory products to the value of about one thousand pounds have been prepared and issued during the year. These have been sold at a price little above the cost of production. If ordinary trade prices had been charged a larger sum would have been derived from this source, but in the interests of the cattle industry it is thought desirable to place these materials at the disposal of the stock owner at the least possible cost.

Quarter-Evil Vaccine.—About seventy thousand doses of this vaccine have been issued. This vaccine, which is known as the "Rhodesian quarter-evil vaccine" from the fact that it differs from any other vaccine issued as preventative against this disease, has proved extremely efficacious. Its cheapness, keeping qualities and simplicity of application render it very popular, and it has to a large extent supplanted all other quarter-evil vaccines hitherto used in this country.

Redwater and Gall-Sickness Vaccine.—There has been little demand for this vaccine, probably because its uses are not generally understood. It may be explained that it is

intended for the inoculation of (1) calves on areas freed from ticks by long-continued and regular dipping, and upon which animals grow up susceptible to redwater and gall-sickness; (2) animals imported from overseas and other redwater and gall-sickness-free countries, provided such animals conform with the specifications laid down in Bulletin No. 536 of 1925.*

With regard to the inoculation of calves, this has been practised by some enlightened stockmen for several years with excellent results. But it appears that the vaccine has not always been properly applied, having been used when it was no longer viable or potent and was no longer capable of causing a reaction. Animals so treated having derived no immunity have been sold as inoculated, and, dying later of redwater and gall-sickness, have brought the inoculation into disrepute. The application of the vaccine also to older animals, for which it was never intended and which are unsuitable for inoculation, has been followed by unfavourable results which have been attributed unfairly to it.

A vaccine suitable for the inoculation of calves has been thoroughly tested out during the past year. On a certain estate where dipping has been conscientiously practised since 1910 the cattle have been proved to be free from redwater and gall-sickness. Here, under varying conditions, seventy-six calves of different ages and at different periods of the year have been inoculated. Of these, four have died. Three of these became bogged through accompanying their mothers to water during their reactions. These deaths occurred in the first batch of twenty, but further fatalities were avoided in subsequent lots which were run in better drained paddocks. Twelve pure-bred calves were inoculated, of which one died, but the cause of death is uncertain. From this test useful information has been obtained, and it can confidently be stated that, properly applied, the present vaccine available is suitable for the inoculation of calves.

This vaccine is not and has never been suitable for the inoculation of older animals under field conditions. Thirty-four locally bred bulls from tick-free farms have been inoculated at the Laboratory. These have included Sussex, Frieslands, Herefords and Aberdeen Angus, and all of them have reacted to redwater and gall-sickness—some of them

* See *Rhodesia Agricultural Journal*, April, 1925.

very severely; in fact, as severely as imported cattle. Two indeed have died from acute gall-sickness. This goes to show how necessary it is on "dipped" farms to inoculate the animals as calves; but one almost despairs of impressing this idea upon the practical stockman, who only realises the necessity when he finds that he cannot sell or move his stock, which die when exposed to natural infection on undipped areas.

Thirty-eight animals imported from Great Britain under the Empire Marketing Board scheme were inoculated at the station, and although the virus was far from satisfactory and many of the animals were unsuitable, only three died. Only one of these, however, died of uncomplicated gall-sickness, their reactions being aggravated by louse infestation and other diseases. These animals, having passed through the necessary quarantine periods in Great Britain and at Capetown, were received in three consignments, in each of which were animals suffering from louse infestation. Several animals were also infected with warbles, and others were suffering from ringworm. In this way the stables became infected, and, it being impossible to dip or wash animals under inoculation, the gall-sickness reactions became seriously complicated. It was at one time suspected that the anaplasmosis was being transmitted from one animal to another by lice (*Hæmatopinus eurysternus*), and that the imposing of one infection upon another was the cause of the very prolonged and severe reactions, which could not be attributed to the vaccine, which in uncomplicated cases caused an entirely different reaction. The application of Derris eventually rendered it possible to control the louse infestation, and with the removal of the irritation and discomfort caused by these parasites the reactions became less severe. This very unfortunate experience has emphasised how important it is that cattle from overseas or neighbouring territories should be free from disease before being forwarded to this country. This subject will be referred to again under the heading of research. It is sufficient here to emphasise the opinion arrived at as the result of recent experience: that only vaccine for the inoculation of calves under veterinary supervision should be issued, and that the inoculation of older animals should not be undertaken until, as the result of experiment

and research, a more simple and safe method of inoculation has been discovered. As will be seen later, research to this end has as far as possible been carried out.

Horse-Sickness.—There has been very little demand for vaccine for the inoculation of horses and mules, which have been superseded by mechanical transport. They are still found useful by some, and the Statistician in his figures for 1928 records that 2,541 horses and 1,352 mules were still in existence in the country. The B.S.A. Police obtained records of 2,562 equines, and of these 313 or 12.2 per cent. are shown to have died from various causes. Of these again 69 or 2.69 per cent. are said to have been inoculated animals. From 1st November, 1928, to 30th June, 1929, there were 288 inoculated riding horses on the Police strength and 34 pack horses, i.e., 322 in all. Of these 9 are said to have died from horse-sickness, that is 2.79 per cent., which corresponds very closely with the general mortality rate of inoculated horses throughout the country. At one time the death rate among Police horses during certain years exceeded 50 per cent., and during the wet season when horse-sickness was prevalent, patrols were curtailed. Now, thanks to the inoculation process, the death rate is rarely above 5 per cent., patrols can be performed at all seasons of the year, and horses are sold or discarded on account of old age.

Infectious Abortion.—About five thousand doses of the special "devitalised vaccine" were issued during the year. Although this disease is regarded in America and other countries as one of the greatest menaces to the cattle industry, little importance appears to be attached to it by the stock owner of this country. He appears to regard a dwindling calf crop as a matter of little or no importance. Possibly with improving prices for cattle he may alter his opinion. Unfortunately, infectious abortion of cattle is now acknowledged to be infective to man, causing in him the disease known as undulant fever, a disease characterised by irregular temperature, profuse sweating, pains in the joints, weakness and general malaise. Possibly in the human female also it may be the cause of abortion. The manner in which it is contracted is not definitely known, but it is probable that in some cases infection may be derived from the milk and other

products of infected cows. Recent observations also suggest that man may become infected by contamination from the after-birth and discharges of infected cattle. This is a matter of some importance, and suggests the desirability of testing all cows, the milk of which is used for human consumption, and of adopting antiseptic precautions when dealing with abnormal parturition cases. Fortunately the testing of suspected animals by the special method devised and adopted in this country is a comparatively simple process and is performed free of charge for those who care to avail themselves of it.

RESEARCH.

A multiplicity of duties has prevented sufficient time being devoted to research into the many problems requiring investigation. These being so numerous and varied, adequate attention could not be given to any one of them. It is impossible to supervise the general routine work of the office and station, attend to correspondence and interviews, control the preparation and issue of vaccines and the inoculation processes, and at the same time carry out detailed research into sheep diseases, trypanosomiasis, horse-sickness, red-water and gall-sickness, ophthalmia, myiasis, vegetable and other poisons, sweating sickness, or the many other ailments which in the public interest should be thoroughly investigated and overcome. Any one of these subjects would provide a whole-time worker with more than ample food for time and thought. Innumerable obstacles have also stood in the way. The accommodation provided by the station, which is less than one hundred acres, is insufficient. When there is any grazing it is over-stocked, and in the dry season animals would starve if rations were not purchased for them. This prevents the carrying out of observations on an adequate scale. For example, the experiments which it was hoped to conduct in connection with the inoculation of cattle against tsetse fly disease have had to be limited to a single span, which since July last has not only suffered from trypanosomiasis, but has barely escaped starvation. In addition, the treated animals when sick have had to travel long distances to be dipped. Another difficulty has been to obtain subjects for observation; for example, cases of ophthalmia and myiasis which it was desired to investigate. It is suggested that if

cases cannot come to the Laboratory, the Laboratory should be taken to the cases, and to this end a travelling Laboratory, such as is provided for the Agricultural Department in the Kenya Colony, might prove very valuable. Associated with the Laboratory would be whole-time field officers detailed to investigate certain diseases in their natural surroundings with all the paraphernalia necessary for the work. Such travelling officers could also give lectures and demonstrations to stockmen, and might work in collaboration with the Veterinary Department. At the time of his retirement Sir Arnold Theiler complained that Onderstepoort had been developed into a huge vaccine factory, which was usurping the proper functions of the laboratory, namely, research. The same objection on a small scale applies to this establishment, and it is a matter for consideration as to whether some re-organisation of the Department is not desirable, in order that the research staff may devote its whole energies to its legitimate labours.

Trypanosomiasis.—In my report of 1928 a very full review was given of the history of the investigations in connection with trypanosomiasis or tsetse fly disease during the past twenty years, showing how the treatment introduced by the writer in 1909 had been the means of saving many thousands of cattle, and how it was hoped that a modification of that treatment might bring about a condition of tolerance or resistance in cattle, comparable to that existing in the game, which would enable them to live in "fly" areas.

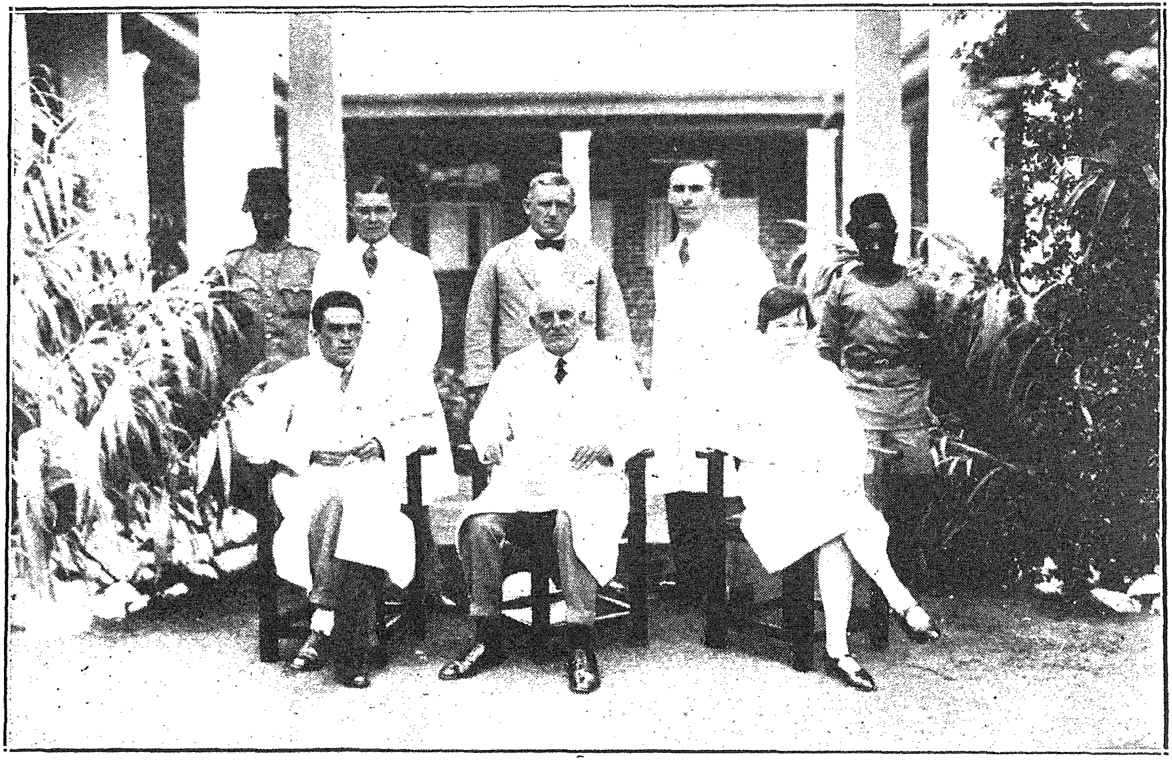
In view of the fact that some eighteen thousand square miles of this country are said to be infested by the tsetse fly, and much of this includes some of the most fertile and highly mineralised parts of the territory, the necessity for research in the hope of overcoming this menace and opening up this vast area for settlement and development appeared obvious. It is probable that the problem will ultimately be solved by the elimination of the tsetse fly, and it was hoped that the efforts of this Department might contribute to this end. There is no doubt that the tsetse fly for its successful propagation requires shade, and examples are known where the cutting down of even small areas of forest has resulted in the disappearance of the fly. With resistant cattle, settlers, miners and transport riders could develop fly-infested

areas, and by cutting down the shelter would probably remove the menace of the "fly." It was thought, therefore, that research in this direction offered a reasonable prospect of success, and it was hoped to be able to prosecute it energetically during the past year. Unfortunately for reasons stated this has been impossible. The first experiment, that described in my report last year, proved unsuccessful. Six inoculated animals and six control uninoculated animals were submitted to natural infection at the Government Entomologist's camp at Chauka, and there became infected not only with *Trypanosoma pecorum*, against which the treated animals had been prepared, but *Trypanosoma vivax*, a complication which had not been anticipated. When this was realised, the animals were hurried back to the Laboratory in order that they might be kept under close observation. Once there they commenced to lose condition rapidly, even when the onset of the rains brought about an abundance of grazing. They were repeatedly treated with antimony and other trypanocidal remedies, but failed to improve, and grew steadily worse. This was attributed to the severity of the mixed infection, although after treatment no considerable number of trypanosomes were ever encountered in their blood. The explanation of this unusual state of affairs, for as a rule animals infected with the local trypanosomes readily respond to treatment, was not discovered until on careful *post-mortem* examination of a dead animal innumerable wire-worms (*Hæmonchus contortus*) were found in the abomasum. This worm, which we now know, is far more prevalent than was previously suspected, gives rise to parasitic gastritis, with anæmia, wasting and general weakness, and indeed to symptoms which in many respects closely resemble those of trypanosomiasis. The triple infection, discovered too late, brought about the death of ten out of the twelve animals. When it was found that the cattle were infected with *Trypanosoma vivax*, experiments were carried out in order to study this parasite, which in recent years had been more frequently encountered than hitherto. Mr. Lawrence endeavoured to infect laboratory animals, but although "various methods were adopted on several occasions, all the attempts failed, thus corresponding with the results of workers in other parts of the world and establishing the fact that in

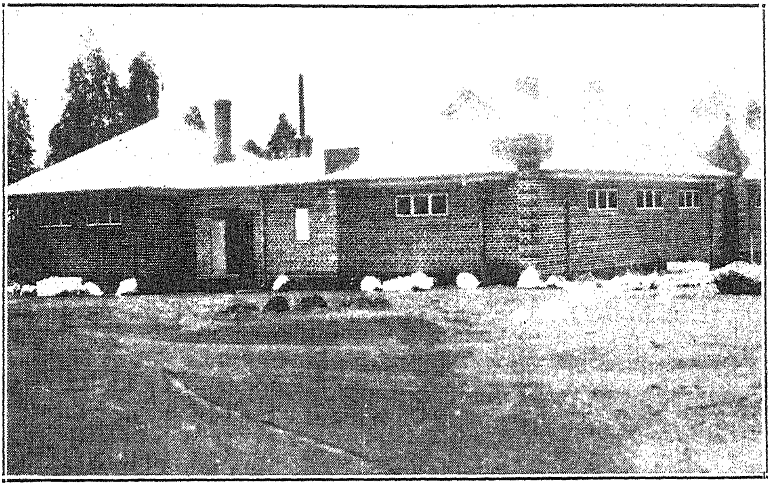
this respect our local strain of *T. vivax* is identical with other strains." In other respects, however, it differs from the *T. vivax* described by other observers. For example, Richardson in Uganda describes it as a "swarming" in the peripheral blood (*Transactions of the Royal Society of Medicine and Hygiene*, Vol. XXII., No. 2, pages 144 and 145), whereas in our cases, as shown by the accompanying table, it was only rarely present, and then only in very rare numbers. Curson in an article entitled "Experimental *T. vivax* Disease in Sheep and Goats in South Africa" (*S.A. Journal of Science*, Vol. XXV., Dec., 1928) states that in his first series of experiments *T. vivax* was seen for the first time in the blood of a sheep in South Africa, and that in his second series *T. vivax* disease was produced experimentally for the first time in sheep and goats in South Africa, but on "no single occasion were the organisms responsible for the malady detected." Lawrence, working as stated at this laboratory, records that he "inoculated a sheep, No. 884, with 25 c.c. of blood taken from sheep No. 795, which was infected with *T. vivax*, and carefully observed the course of the disease, making daily examinations of blood smears. Trypanosomes appeared on the ninth day, and were present in blood smears on 16 days during the course of the disease, which lasted 45 days." He writes: "In view of Curson's results, the appearance of trypanosomes on so many occasions in this case is of considerable interest, as it would appear that our strain differs in pathogenicity from the one he employed." My own experience with sheep and cattle has shown that *T. vivax* does re-appear in the peripheral blood of sheep and cattle occasionally, but never in large numbers. Details of this work must form the subject of a separate report. Authorities also differ concerning the response of *T. vivax* to treatment. At first I was of opinion that it was resistant to antimony, but my deductions were found to be wrong when it was discovered that the cattle were suffering from verminosis, *H. contortus* infection. It appears now that the local *T. vivax* infection behaves, as regards treatment, much in the same way as the local form of *T. congolense*, or *T. pecorum* as I prefer to call it, namely, that while the animal is not cured in the sense that the parasite is destroyed, it becomes tolerant or "premunised," a term which indicates that the animal can carry

the parasite although unharmed by it. This fact is all to the good as far as my method of inoculation is concerned. It may be pointed out that this method is based upon the practical experience, extending over a period of twenty years, that animals which have recovered as the result of treatment return to work in the "fly" areas and are apparently immune. This has been the general experience. A correspondent writing on this subject says, "I have animals still working here that I treated as long ago as 1924. They are in excellent condition at the present moment and among some of the best oxen I have got." Numerous other examples could be quoted. In certain areas cattle are systematically treated once or more times every month with a view to catching the animals newly infected by the tsetse fly. In this way the mortality is reduced almost to a negligible quantity, but the process is cumbersome and requires time and labour. The idea underlying the inoculation process is to deliberately infect animals with a virus of known strength, rather than to wait for a promiscuous infection by the "fly," and to treat at the right moment, which is determined by laboratory observations, thus setting up deliberately a condition which in the past has been established by the haphazard method of field infection and treatment. Hornby, of Tanganyika, in his annual report for 1928, criticises this method and says, "We fear that this method will not be of much practical value." The method being based upon practical experience, we are not dismayed. In my preliminary communication to the *Transactions of the Royal Society of Tropical Medicine and Hygiene* I clearly stated "the above method may be applicable only to the conditions obtaining in Southern Rhodesia." Even if its usefulness is limited only to this country, two-thirds of which are potential "fly" country, it would be of considerable practical value.

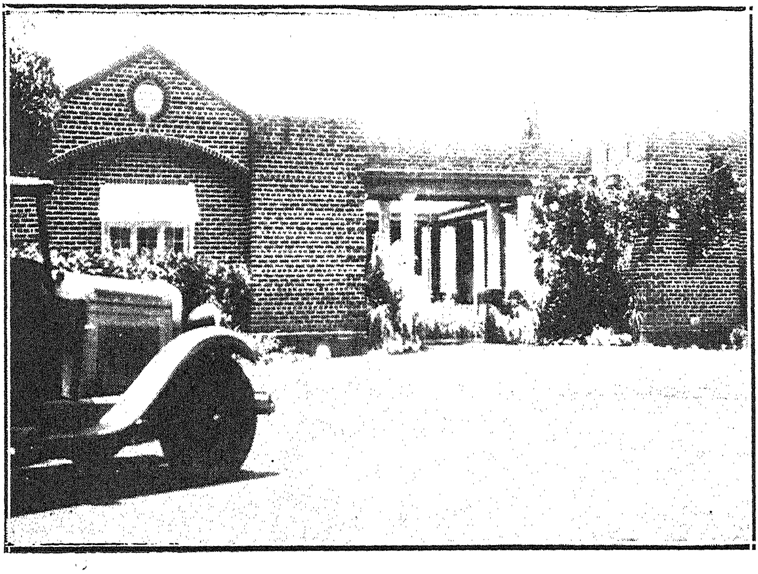
It was intended during the year under review to test this method out on a large scale, but unfortunately difficulties arose in connection with the purchase of suitable animals, and only one span has been available for detailed experiment and observation. Fourteen oxen were inoculated in August last, and were appropriately treated. All of them suffered from trypanosomiasis, and all but one, which fell into a hole on its way to the public dipping tank, recovered, notwith-



The Director of Veterinary Research and staff.



The stables, Veterinary Research Station, Salisbury.



Veterinary Research Laboratory, Salisbury.

standing the fact that during the latter part of the dry season they were almost starving under veld conditions and had to be kept alive by a ration given at night; and during the early part of the wet season were subjected to constant and exceptionally heavy rains, nine inches falling in the first two weeks. It is, of course, well known that under natural conditions animals infected during the dry season may linger on and succumb with the first rains. The resistance of the treated animals therefore is very satisfactory. With the new grass the treated animals immediately improved in condition and are now among the fattest animals on the station. All that remains now is to test their resistance to re-infection with natural virus. Experiments have been carried out during the year with other animals to ascertain whether they can support re-infection with the same virus, or with the same virus exalted by passage through highly susceptible animals, and in every case, except for a slight and transitory elevation of temperature and a temporary invasion of the peripheral blood by trypanosomes, no indication of re-infection has been manifest. It is hoped before the end of the year, with the assistance of the Veterinary Department, to obtain a natural strain of virus of high potency to apply to the thirteen oxen, with a view to testing their immunity, and if they prove resistant to send them to the area from whence the virus is obtained and subject them to infection by the bite of the "fly." Many experiments having a bearing upon this method have been carried out. It has been sought to ascertain how long the "tolerance" resulting from treatment lasts, and it appears that parasites remain in a dormant form for long periods, in one case over a year.

Experiments have also been carried out to ascertain whether a mixed infection with *T. pecorum* and *T. vivax* gives rise to a more acute disease than infection with one or other alone. Contrary to what was expected, no difference in the severity of the disease in the different groups of inoculated animals could be recognised. It has been thought that in natural conditions animals infected with *T. vivax* suffered from a more severe form of the disease, which did not respond to treatment as readily as cases of *T. pecorum* infection. Laboratory tests suggest that this impression may have been wrong, but it must always be remembered that syringe

infection with laboratory strains is a very different thing to infecton by the tsetse fly with natural strains.

Various drugs have been tested in the hope of finding a preparation of antimony more easy to apply and which can be injected under the skin rather than into the vein, which is necessary in the case of tartar emetic. A Bayer preparation, "Antimosan," has been used in the treatment of the inoculated span, and this in most cases can be injected, without harmful effect, under the skin. But in some cases a swelling occurs. This does not eventuate in abscess or slough, but renders the animal lame and unsuitable for work—a disadvantage when "trek" oxen are concerned. Recently Bayer Products, Limited, have supplied a sodium salt of the same agent which it is hoped may be free from these disadvantages. Unfortunately the drug is more expensive than antimony potassium tartrate, and this under existing conditions may render its use less popular than the very inexpensive "emetic" solution.

It was decided at the Pan-African Conference that a better method of diagnosing trypanosomiasis was needed, and Mr. Lawrence, who attended the conference, on his return attempted to devise such a method based upon the complement fixation test. He experienced some difficulty in preparing a suitable antigen, but in his report states, "Further experiments in this connection are in progress, and it is hoped that the difficulties of preparing the antigen will be overcome."

Much other work in connection with this disease has been performed, but always with a view to its practical application. There are many other more fortunate individuals who can occupy their time in the theoretical consideration of the subject. Sir Ronald Ross has said, "To me it always seemed that the practical application is the summit of all biological research," and the limited time of the officers of this Department has been devoted to the practical rather than the theoretical and academic side of the subject.

SHEEP DISEASES.

In his annual report for 1928 the Government Statistician states that more attention is now being given to sheep breeding in this country.

European-owned sheep totalled 79,669 and native-owned 279,678, the latter showing a decrease of 2,563 compared with 1927. Generally speaking, the latter are a very inferior type of animal, and the majority of those belonging to Europeans are very little better. The District Veterinary Surgeon, Gwelo, who has taken a keen interest in sheep farming in the Midlands, in a recent contribution to the *Rhodesia Agricultural Journal*, states: "The losses sustained from different causes up to the present time about counterbalance the natural flock increase, so that the position to-day generally is not satisfactory. However, some of the reasons for these failures are known, and if the recommendations are adopted an improvement will result." He adds: "One common experience in sheep farming is that a small flock of, say, about 50 sheep usually does all right under practically any conditions, and it is when farmers, encouraged by this success, branch out and increase their flocks that the difficulties and losses arise." This is a very common experience, but the reason for it has not yet been determined. It may be due to a deficiency in some essential element in the grazing, or it may be that the pastures become infested with disease, or may be a combination of both. The important question as to the value and improvement of pasture grasses is soon to be investigated by the Chief Chemist of the Agricultural Department, under the ægis of the Empire Marketing Board, and valuable information will probably be acquired. In the meantime the many diseases to which sheep are subject in this country should be carefully investigated, for if the industry is to progress it must be based upon a sound foundation. These diseases are so numerous and so little understood that it might prove a profitable investment to detail a properly qualified veterinary research officer to devote his whole time to the study of them in the laboratory and in the field. On every possible occasion during the year one disease or another has received consideration, but any investigations which it has been possible to make have been of a very desultory character. One of the chief subjects studied was verminosis, and innumerable drugs and combinations of drugs were tried out with a view to finding a remedy which would destroy the various species of worms which are located in different parts of the alimentary canal. Mr.

Lawrence made some further investigations concerning iodine, the vermicidal effects of which were discovered by Huston in this Laboratory in 1924. He was able to confirm Huston's and my own observations that Lugol's iodine in high solution is very efficacious against worms *in vitro*, but found by calculation "that the amount of iodine which would be required to bring about this dilution in a sheep was excessive." I myself had discarded this drug for another reason, namely, that starch has such a strong affinity for it that in the alimentary tract of the sheep, the contents of which are composed chiefly of starchy material, none of it was left available to exert any influence upon the worms. Lawrence also carried out experiments to ascertain whether arsenic when inoculated subcutaneously could make its way from the circulation through the bowel wall into the lumen. He found that "arsenic could be found in the lumen of the intestine, having got there by way of the vascular system through the bowel wall, excretion through the liver via the bile duct being definitely excluded." We have to thank the Chief Chemist of the Agricultural Department for his assistance in connection with the analysis of these and numerous other samples of bowel contents which have been submitted to him during the year, also for his valuable assistance and advice in chemical problems associated with these researches.

Among other diseases of sheep requiring investigation is a form of nasal catarrh, which at certain times in the year becomes so acute that breathing becomes difficult and the sheep loses condition rapidly. By aspiration of septic nasal discharges, pneumonia not infrequently follows. There is also a very acute form of pneumonia, which occurs chiefly during the wet season and which appears to be infective. Gaining virulence by passage, it becomes very fatal and the cause of a very heavy mortality. Another disease of sheep far more common than is generally suspected is quarter-evil. When diagnosed this can be dealt with effectively by inoculation. This is not always manifested by muscle lesions, as in the case of quarter-evil in the ox, but more frequently assumes an intestinal form, giving rise to what laymen describe as "inflammation of the bowels." In this respect it resembles some forms of "braxy" in sheep in parts of

Scotland, or "struck" in the Romney Marsh. It is prevented, however, by the application of the "quarter-evil" vaccine issued for the protection of cattle. Experiments are still in hand in connection with the most urgent of these diseases, but it would be premature to make any pronouncement concerning them in this report. Suffice it to say that it is hoped that some measure of success has been achieved which may prove of benefit and assist the development of an industry which, whether conducted on a large or a small scale, is generally regarded as one of the most profitable branches of agriculture.

REDWATER AND GALL-SICKNESS.

These diseases have been dealt with at some length in a previous section of this report, where reference was made to experiments in connection with the application of the virus-vaccine to calves. These experiments were made possible by the kindness of Mr. Glanfield, of Ballineety Farm, who placed his farm, cattle and transport at my disposal and gave me every assistance in carrying out a large field experiment on a practical basis. The opportunity of dealing with so large a number of susceptible animals, both pure-bred and highly graded, and of varying ages, and of keeping them under close observation throughout the year, was eagerly seized, and most valuable information has been derived from it. With every group inoculated, certain calves were left uninoculated to serve as controls. It may be confidently stated that at the present time, if it were not for certain distinguishing marks, it would be impossible to detect any difference in condition or growth between inoculated and uninoculated animals. The market value of the former, however, has been appreciably increased. As far as calves are concerned the inoculation process may be regarded as completely satisfactory. This, however, is not the case with older animals, and if it were not that inoculated animals are urgently required for the building up of the industry, the present process should be suspended. But it is felt that although there are at present markets for our stock, the general quality of our cattle will have to be improved if we are ultimately to compete in the meat markets of the world. This will take time, and in

order that a commencement may be made without delay, the importation of well-bred animals from overseas is urgently needed. Unless inoculated, the mortality among such animals from tick-borne diseases will be severe. Intensive research, therefore, with a view to finding a less difficult and dangerous process than that at present employed, is considered desirable. To carry out such research highly susceptible animals, preferably from overseas, where redwater and gall-sickness do not exist, are essential. Unfortunately these have not been forthcoming, and during the past ten years only two consignments for this purpose have been received, so that from time to time the virus has died out and great difficulty has been experienced in re-establishing it. The endeavour to do so was made by using locally bred animals, but as their natural or inherited susceptibility and resistance were unknown quantities, accurate deductions could not be made from them, and unfortunate errors arose. In March last it was agreed to import three consignments of six suitable animals yearly; these to be used for redwater and gall-sickness tests and later to be sold for stud purposes. The first consignment is expected to arrive in March, 1930. In the meantime the experimental work has had to be carried out on locally-bred animals, which have proved to be susceptible, but are not, as stated, reliable subjects for the test. If, from results with them, the deduction is drawn that a virus is sufficiently mild, but when introduced into valuable imported cattle of higher susceptibility or less resistance it is found to be of deadly virulence, an unfortunate situation might arise. For years past, in order to "carry on," such a risk has had to be taken, and a very grave responsibility has had to be accepted by those undertaking this work. It was for that reason that the recommendation that the present process should be suspended was made. Every effort, however, was made with the material available to find a less dangerous method, and it was decided to again try out the method adopted in the Union. This consists of inoculation with a virus containing a mild redwater element and a variety of gall-sickness caused by *Anaplasma centrale* of very low virulence. Similar virus has been tested in the past, but was found unsuitable, in that it did not convey immunity against some of our local strains of virus. For example, a

heifer supplied by Sir Arnold Theiler in 1911 as a carrier of *Anaplasma centrale* virus died from *Anaplasma marginale* infection when inoculated later with blood from a local animal. Similarly imported bulls inoculated with the blood of the heifer suffered from gall-sickness reactions, from which many died on exposure to local natural infection. Again in 1918 a strain of *A. centrale* virus was obtained from Onderstepoort and proved equally disappointing. It was realised, however, that when the *centrale* virus was applied first and a local virus after, the reaction caused by the latter was modified and rendered less severe. In Kenya Colony advantage is taken of this fact and a double process of inoculation is practised, the Union virus being applied first and the local virus later when immunity against the first is established. Unfortunately this process takes as long as 150 days to complete, which, as far as this country is concerned, renders it impracticable. It was decided to endeavour to reduce this period, and a strain of *A. centrale* virus having again been kindly supplied by the Director of Veterinary Services of the Union, experiments were immediately put in hand. These are not yet completed, but as far as they go they appear to be quite satisfactory.

HORSE-SICKNESS.

This subject has been dealt with elsewhere. It was not intended to carry out any special research work in horse-sickness during the year, but it became necessary to collect and standardise a virus-vaccine in order to inoculate the newly purchased Police remounts. This was done successfully at the first attempt. Shortly before this the Director of Veterinary Services of the Union had requested me to supply him with virus-vaccine, as he desired to ascertain whether my method of inoculation could be applied in the Union. It was thought wise, therefore, to carry out certain preliminary tests to determine whether the immunity conveyed by my method would protect horses against Union strains of virus, and Professor du Toit sent me two very deadly strains in order to carry out the experiment. It was interesting to find that a horse inoculated by my method in August, 1920, and since exposed in the Shamva district, resisted a dose of Union "O" virus which killed a control

horse in seven days. Similarly, a horse inoculated by my method in October, 1928, resisted a lethal dose of the same virus; also a horse inoculated by the Rhodesian method in May, 1929, proved equally resistant. Another horse inoculated with my virus in October, 1928, resisted a second deadly Union virus "N" reputed to kill in about six to eight days. These results being satisfactory, a supply of Rhodesian vaccine 828 was sent to Professor du Toit, who is now carrying out experiments with it. So far these have proved satisfactory.

MISCELLANEOUS.

The observation of a number of cattle said to have "salted" or recovered from East Coast Fever, with a view to determining whether in any circumstances a relapse of the disease occurs, was continued throughout the year. The temperature of each animal was taken daily, and whenever any deviation from normal occurred, blood and gland smears were taken and a careful search made for *T. parva* or Koch's bodies. These, however, were never found. In one case, shortly after the onset of the rains, *Piroplasma bigeminum* was found, indicating that the conditions to which the animal had been subjected were sufficient to bring about a breakdown of immunity against redwater. But no East Coast Fever parasites could be detected.

The veterinary administration of East Coast Fever largely depends upon whether the "salted" ox can become a "carrier" of infection. Investigations in this connection are being carried out in Kenya, where, the disease existing in enzootic and epizootic form, the facilities for such research are more favourable than in this country.

Two diseases which have been reported to this Department as of great importance, especially on certain ranches where a European staff has to be employed to deal with them, are "myiasis" or "screw-worm" disease and "ophthalmia" of cattle. As far as possible attention has been given to them during the year and "devitalised" vaccines have been prepared. It is too early to state yet whether these are of any value.

Distomiasis or "fluke" disease is reported as becoming far more prevalent in cattle than hitherto. This yields

readily to treatment, extract of male fern and carbon-tetrachloride having been found efficacious. Both of these need to be used with discretion. Two Sussex heifers at the station, inadvertently given a slightly larger dose of a proprietary preparation of male fern than recommended, were rendered totally and permanently blind. Parasitic gastritis in cattle caused by the "wire worm" *Hæmonchus contortus* has also been found to be more prevalent than was suspected. This readily yields to treatment with copper sulphate, but affected animals, even after treatment, take a long time to regain condition, especially in the dry season, when grazing is scarce and lacking in nutritive properties. It is probable that many animals which are said to have died from "poverty" towards the end of every dry season are infected with wire worm. A bulletin has been written on this subject, and stockmen have been advised to be on their guard in order that they may detect the disease and apply appropriate treatment before it is too late.

Mr. Lawrence investigated a strange disease of cattle in the Marandellas district, characterised by nasal catarrh, conjunctivitis, blindness, rapid loss of condition and in some cases death within a week. This, after careful investigation, he attributed to a vegetable poison picked up in certain old native lands. Feeding tests with plants collected from the area did not reveal the actual poison.

Experiments were continued to determine whether the contagious abortion of cattle in this country is identical with that of cattle in other parts of the world. The infectivity of this disease to man renders a study of this subject of more than academic interest. The agglutination test revealed an affinity between the serum of locally infected cattle and strains of *Br. abortus* kindly supplied by the Director General of the Department of Agriculture, New Zealand, namely, the original Australian strain of Seddon, a New Zealand strain recovered from the membranes of an aborting heifer, and an international strain issued from Copenhagen for use of hospitals "for investigation into the human sera." Our own sera appeared to agglutinate more strongly with the Australian strain than the other strains, but further observations will be made when opportunity arises.

The Utilisation of Wood in Southern Rhodesia.

CONVERSION AND DISPOSAL OF TIMBER.

By T. L. Wilkinson, M.Sc., B.Sc.F., District Forest Officer.

Preceding articles on the utilisation of wood have shown how timber should be treated once it has been converted into the form in which it is to be used. It is now proposed to deal in a series of articles with the uses to which native and introduced timbers may be put on the farm.

Prior to discussing the specific uses of timber—i.e., for fencing, fuel, sleepers, tool and implement handles, shooks, building, furniture, etc.—and the most suitable timbers to use for these purposes, it is proposed in this article to describe briefly how timber may be prepared for market, or alternatively, converted on the farm.

The Selling of Timber.—The usual methods employed by those having limited supplies of timber to dispose of are by selling it privately, by public auction or by tender as it stands, or to cut the trees into logs before offering for sale. In the case of small lots of timber standing at a distance from a suitable market or railway it is usually better for the seller to have some idea of the price he is likely to receive while it is still standing, as when once cut the timber must sooner or later be sold, whatever the price may be.

With very small lots the expense incurred in selling by auction would probably be out of proportion to the extra price obtained, and in such cases private sales are usually more satisfactory. An arrangement as to price can either

be made before the trees are cut, or the trees can stand until a better offer is forthcoming. With larger lots, or where owners of several small lots combine for the purpose of selling, auction sales may be advantageous in districts where there is a prospect of a fair number of buyers attending and where the timber is of sufficiently good quality to create competition.

Sale by tender may be used instead of either of the above methods if the quantity for sale warrants it. The procedure in this case is to advertise for tenders, stating species and quantity available, submitting conditions of sale, etc., to *bona fide* applicants. The main points for inclusion in conditions of sale are the same as for a contract in sale, and are as follows:—

1. Description and location of the timber.
2. Price and manner of payment.
3. Conditions of cutting and removal.
4. Title and means of settling disputes.

Under the third heading are laid down the provisions regarding the duration of the contract, the marking of the timber, if not clear felling, the diameter limits, the method of measuring, separation into qualities, the degree of utilisation, protection against injury, protection of property and repairs of damage.

For such sales it is beneficial to grade all logs and trees into species, and further to grade logs or converted timber into similar sizes and qualities. It is advisable for the owner to draw up a written contract covering every sale of timber. Even in small sales much trouble and financial loss have resulted from failure to put the terms of the sale in writing.

Valuation of Timber.—Whatever method be employed for selling timber, the owner should be able to judge its approximate value per cubic foot, or in the case of fuel, per cord, as it is upon this that the sale of timber is based. As this value will vary in different localities, only general rules for assessing the value of timber can be given.

It may be stated generally that timber varies in value per cubic foot, according to species, quality, proximity to a market or consuming centre, the conditions for removal and the existing local demand. Quality of timber depends upon

soundness, the size of the individual tree and the straightness, freedom from knots and length of the bole, i.e., that part of the stem below the branches.

The distance from a market and the position in which timber is situated affect the market price considerably, as the cost of conveying it to the place in which it is to be sawn up is frequently heavy, and with timber of poor quality may equal or exceed its delivered value, consequently the timber becomes unsaleable. Inferior trees growing in deep hollows or on areas with long bad roads between them and the consuming centre are often difficult to dispose of, and low prices must be expected. On the other hand, timber of good quality, standing close to good firm roads and within about eight miles of a local sawmill, railway station or siding, may be expected to yield fair prices, varying according to the species of trees offered.

In all new countries experience shows that considerable difficulty is at first met with in marketing locally grown timbers. There is usually strong prejudice. The prejudice is generally based on a lack of knowledge of their properties as well as faulty methods of preparing them. A good timber is often unsaleable simply because it is wrongly treated. As, however, the indigenous and locally grown timbers become better known and suitably prepared there will inevitably be a demand for them, and they will compete more than favourably with imported timbers.

It is essential, if timber is to be successfully marketed, for the seller to know what he wants to sell, therefore he should make or obtain a reliable estimate of the volume, quality and value of the timber to be sold. Further, prior to any sale the conditions of markets should be investigated. Remember that standing timber can usually wait over a period of low prices without deterioration. Advantage should be taken to sell when prices are favourable.

In certain circumstances it may be more profitable to fell or fell and convert timber on the farm prior to sale; also converted timber may be required for use on the farm. For these reasons the methods of felling and simple conversion are outlined below.

Felling.—The time of felling, provided that conversion takes place at once, depends to a large extent on the method of seasoning employed. If kiln drying is used, then the season of felling is immaterial; but if air seasoning is resorted to, then late summer or early winter felling will probably give the best results.

Conversion, particularly of immature eucalypts, should follow felling as rapidly as possible. It is erroneously thought by some that it is best to season timber in the log or large baulks, and that if sawn immediately after felling, the wood will warp to a great extent. This point of view is controverted in the article entitled "Seasoning of Rhodesian Timbers," which appeared in the *Rhodesia Agricultural Journal* of November, 1929.

Timber which is to be used in the round should be seasoned prior to use as shown in Fig. 2 of the above article. After conversion and seasoning, if the timber is to be used in situations where there is a possibility of insect or fungi attack, it should be treated as indicated in the article entitled "Preservation of Timber," which appeared in the *Rhodesia Agricultural Journal* of January, 1930.

There are numerous methods of felling trees, but those most commonly used and those which it is thought desirable to use in the Colony are:—

1. Small trees to be felled by axe alone.
2. Large and medium trees to be felled by axe and saw used in combination.

Prior to describing the actual methods of felling it is desirable to describe briefly a few points which must be observed in order to make the operation of felling successful.

The control of the direction of fall is very important, since it is desirable (1) to fell the tree in such a manner that it does a minimum amount of damage to itself and to the surrounding trees and logs, especially if the former are to remain standing for any reason after operations have been completed; (2) to pay attention to the manner of extracting the logs. For this reason it is usually better to fell all the trees in one direction.

The direction of fall is governed by several factors, e.g., the prevalent wind, the nature of the ground and the shape

of the tree's crown. The lean of a tree is not important unless it is very great, since the tree can be thrown in the direction required by wedges. It is better to fell trees uphill when this is possible. On flat ground, however, the prevalent wind and crown shape are of more importance. Felling with the wind direction or on the side of the heaviest part of the crown greatly assists the operation. In all operations it is important to leave the wood or plantation in good condition; hence it is desirable, if there is a likelihood of insect or fire damage, to remove and dispose of the debris left after felling. Where coppicing is desired the stumps should be as low as possible, so that strong coppice shoots may result, and the surface of the stumps should be reasonably smooth so as to reduce liability to decay.

A preliminary operation in felling, whether it is by axe alone or by axe and saw, is notching. This operation consists of making a wedge-shaped notch or undercut on the trunk in the direction of fall, the object being to guide the tree and prevent the bole from splitting before it is completely severed from the stump. The notch has a horizontal base, which should extend slightly past the centre of the tree if felling is to be done with the axe alone, and from one-fifth to one-fourth of the diameter if a saw is used in conjunction with the axe. The undercut on trees that lean heavily in the felling direction is made deeper than usual in order to ensure a clean break. On those that lean away from the felling direction a small notch is cut, because it gives the wedges greater power. The notch is placed from two to four inches below the point at which the felling cut is started on the opposite side. The notch should be as near the ground level as it is possible to make it without causing undue extra work in felling. Hardwood timber, if improperly notched, pulls long splinters from the heartwood. This may be overcome by continuing the centre of the undercut into the heart of the tree. When the tree is severed on the opposite side a clean break will result.

Felling with an axe alone is done by cutting a wedge-shaped notch opposite and slightly higher than the undercut. The cut is continued towards the centre of the bole until the tree falls. In the felling of medium and large timber

the axe is used to make the undercut and the saw the opposite cut.

When the bark contains sand or other gritty substances it is customary to remove it from the base of the tree at the point where the saw cut is to be made. The saw cut is then made on a level with or slightly above and opposite the undercut. When the saw has buried itself, wooden or iron wedges are driven in behind it to prevent binding. As sawing proceeds, the wedge point is made to follow the back of the saw by occasional blows from an axe head or a sledge hammer. Sawing in a direction parallel with the undercut progresses until the tree begins to fall, whereupon one sawyer withdraws the saw and both seek a place of safety. When timber is felled in a direction other than that in which it leans the most wood should be left between the saw cut and the undercut on the side opposite to that to which the tree leans. This tends to pull the tree in the desired direction.

Logmaking.—The bole is usually the most valuable portion of the tree, and it is necessary to trim it, cut it into merchantable lengths and in some cases bark it prior to its removal from the felling site. The amount of bole utilised depends on the market and ultimate use of the timber. In many cases only the clear bole is taken, the remainder with branches being used for fuel, etc. For farm purposes all straight timber will probably be used for purposes other than fuel, and will need to be prepared as follows:—

(1) The first step in logmaking is to cut the limbs from that portion of the bole which is to be utilised. This is done with an axe; the branches or limbs are to be cut off as close to the bole as possible without cutting into it.

(2) The bole is then marked off into log lengths. The lengths depend entirely upon the ultimate use of the timber. For most market purposes logs from 10 feet to 20 feet long are desirable.

(3) When the logs have been marked off the bole is cross-cut with a saw, wedges being driven in behind the saw to prevent binding. The wedges are made to follow the saw by tapping them in from time to time. Logs should always be cut several inches longer than ultimately required

to allow for inexact cross-cutting, damage in transit, etc. Three inches is sufficient for logs under 16 inches in diameter and 4 inches for logs of greater diameter. Log lengths should be judged by quality. It is a mistake to have 6 to 10 feet of clear timber, then include 2 or 3 feet of knotty timber; it is better to separate these portions.

In cases where timber is to be used in the round, i.e., for posts, poles, etc., it is advisable to remove the bark soon after the tree is felled, since the bark comes away more readily when the log is full of moisture. Barking is done by beating the bark with the back of an axe until it is bruised and free in places; it can then be levered off without difficulty. With larger logs, which are to be converted, it is not necessary to bark them unless they are going to be squared with a broad axe or adze prior to conversion or use. For many purposes on the farm it may be more economical to square timber by this means rather than to square it with a saw.

Tools Used in Felling and Log-making.—

Felling Axe.—The felling axe is used for felling, log-making, trimming and other chopping work. The head is made in a variety of patterns, and of several weights. The chief types used in Southern Rhodesia are: Hardy's, the Brazilian or Spanish type for natives; and for better class work, with more careful usage, the Kelly or Brades. The latter type are the most widely used in America, Australia, etc. In Europe modified axes of this type are used, but their efficiency is not nearly so great.

Broad Axe.—This is used for hewing timber into sleepers and work of a similar character. The more common type is 11½ to 12 inches long, with a heavy square poll, and a flat inner face. It may be used either right handed or left handed. The outer side has a slightly concave face, and a cutting level three-quarter inch wide on the bit. The usual weight of the head is 6 to 7 pounds. Handles are from 26 to 36 inches long, with a slight upward curve immediately behind the eye, which enables the workman to assume a more upright position and still maintain a correct cutting angle for the blade.

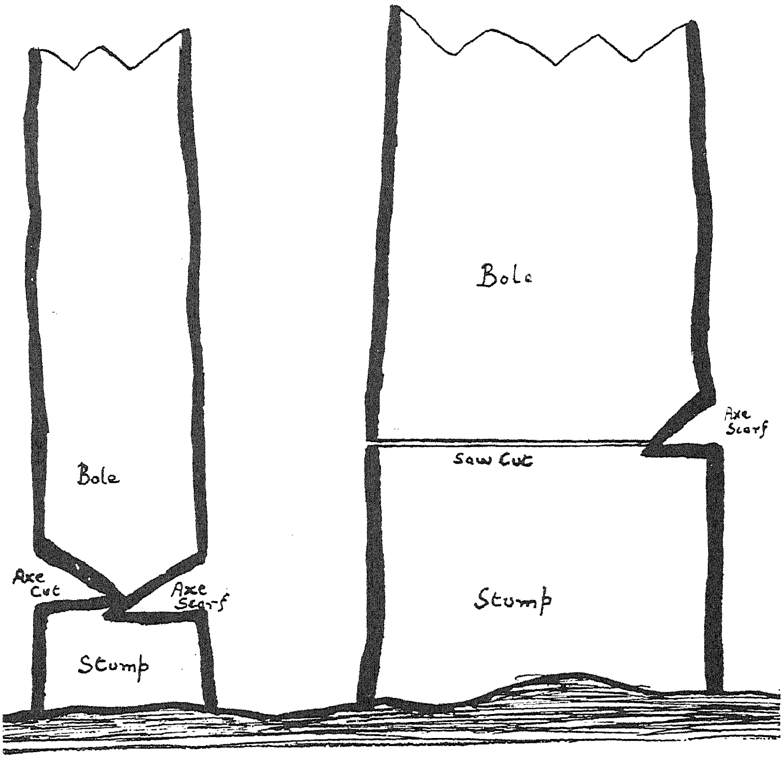


Fig 1.—On left, felling with axe alone. On right, felling with axe and saw in combination.

Fig.2

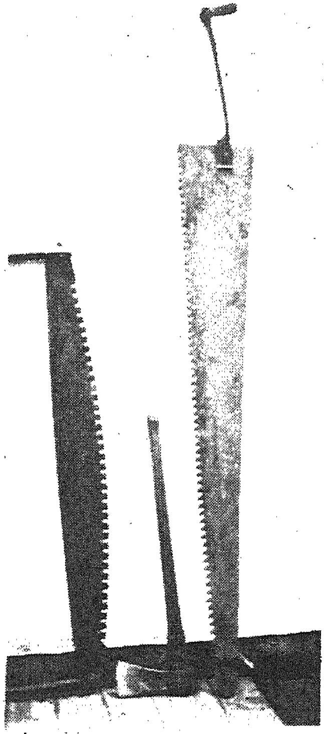


Fig.3

Fig.4

Fig 2.—Felling with saw, scarf with axe made on opposite side of tree.

Fig 3.—Cross-cut saw on left; pit saw on right; one type of felling axe in centre.

Fig. 4.—One method of hauling big logs too heavy for wagons.

Saws.—These are made in a variety of lengths and widths of blades, and in numerous shapes and patterns of teeth to meet special requirements. Figure 3 shows typical types suitable for Southern Rhodesia. The handles situated at the ends may be either in the same plane as the saw face, or for cutting stumps low to the ground at right angles to it.

The sharpening and setting of saws is very important; but since this can be learnt only by demonstration and practice, it is of very little use describing these operations here.

Wedges.—These may be made of iron, steel or hardwood; their size, weight and shape is very much a matter of individual preference. Felling wedges are usually, however, longer than those used for log-making. Since smooth-faced wedges are likely to rebound, it is advisable to roughen their faces with a cold chisel or have shallow grooves made on them.

Mauls and Sledges.—These are used for driving in the wedges. They vary in size and weight with the type of work upon which they are employed.

Peaveys or Handspikes.—These are used as a lever to handle logs, and are indispensable in shifting or turning them. The socket peavey with a round bill hook will most probably find the widest favour in this Colony.

An *Adze* may be found useful either with or instead of a broad axe for squaring timber, but its use is more limited, and less rapid than the broad axe.

Logging.—Owing to its weight the transportation of timber involves certain difficulties, and if it has to be conveyed any distance, considerably reduces the profits obtained therefrom. When only a limited quantity of small size logs are available it is probable that the most economic means of transport will be by wagon drawn by oxen or tractor. Where large quantities of timber are concentrated in a comparatively small area, it may be advisable to erect a small sawmill on the site and convert the timber prior to marketing, or even to run light tram lines from the area to a conveniently placed mill. For the conversion of small quantities of timber for farm or local use, probably the best

method will be to haul the timber on wagons to a sawbench worked from an engine stationed at the homestead or tobacco barns, or to have a small co-operative sawmill run by a group of farmers.

Logs taken from trees scattered in natural woods, or from thinnings or final fellings in plantations are usually dragged by means of oxen to roads or the edges of plantations, where they can conveniently be loaded into wagons. One of the simplest ways of loading in such cases is by pushing or pulling the log on to the wagon over poles resting against it. If it is possible to concentrate large quantities on to one spot, then the building of a ramp or loading bank alongside which the wagon may be driven will greatly facilitate loading and reduce handling costs.

Conversion of Timber on the Farm.—The method of conversion depends largely on the ultimate use of the timber. Timber used in the round for posts, poles, etc., requires only such treatment as may be given it at the felling site, i.e., felling, log-making, barking, seasoning and impregnation. Timber for rough use in buildings on the farm, sleepers or in baulks, may well be converted from the log by:—

1. Broad-axing or adzing.
2. Pit sawing.

With practice and experience timber may be converted very accurately by these methods and at a very little cost. By the latter method, planks, etc., may be cut, which are quite suitable, not only for building construction, etc., but also for joinery work.

Conversion by a broad axe is the method used in America and Australia for making baulks of timber, railway sleepers, piles, etc., and in tropical countries for squaring logs roughly prior to export. With experience the work becomes quite as accurate as sawing. The method of procedure is to stand on the log, and with the axe roughly slab one side, then the other; the log is then turned, and the other sides slabbed to make the log approximately square or rectangular, as the case may be. The dimensions of the material to be cut are then marked on the log by tape, cord and crayon, paint or tar, and the baulk trimmed to the required size. Admittedly this method is wasteful, but when outlay on sawing

machinery is not possible, or when it is desired to convert a log on the felling site for any purpose, it has its value.

Conversion by Hand-sawing is best done by what is known as pit sawing. The equipment required for this is a crosscut (pit) saw, a pit varying in dimensions according to the type of log to be cut, and logs or baulks placed across the pit on which to rest the log or timber to be sawn. A convenient size for a pit is 7 to 9 feet deep, 3 to 4 feet wide, and from 10 to 15 feet long, or longer. Across the pit are placed two or more logs or roughly squared baulks of sufficient strength to support the logs to be sawn. Eight inch diameter logs or baulks will suffice for most purposes in Southern Rhodesia. These cross pieces should be free from bark, and preferably of a durable wood. The log, not necessarily barked, is placed across these supports lengthwise over the length of the pit. It may be kept in place by slabbing one side on which it can rest, by wedges, or by metal pins let into holes made on the supports. When the log is in place, and the dimensions of the material to be extracted have been marked on it, one sawyer takes up a position on the supports, or on the log above it, and another in the pit immediately below it. Sawing commences at one end of the log, which is moved along as sawing progresses, the cut being prevented from closing by means of wedges placed on top of the log behind the saw to permit its free vertical up and down motion. The operation at first may seem difficult, and the boards, etc., not true, but this will be overcome with two or three days' practice.

The main points to be borne in mind are that the saw should not be pushed, since this not only means unnecessary work, but also causes the saw to jamb, and throws it off the line of cut. A vertical up and down motion is all that is required, the sawyer towards whom the saw is coming pulling with a steady, regular motion. The saw should be kept set and sharp, since this greatly facilitates the work and ensures greater accuracy. Timber may be squared to any dimensions once the log has been broken down. This operation may take place at the felling site or at any other site convenient to the farmer. The advantage of carrying out the conversion at the felling site is

that sawdust and waste need not be removed, thus effecting a considerable saving in transport.

Where funds and power are available, the use of a saw bench is the most general and satisfactory method of conversion.

A small stationary table saw bench capable of dealing with logs up to 15 inches in diameter can be purchased in the Colony for from £20 to £40. If suitable material is available, the farmer may purchase a circular saw, spindle, shaft, pulleys, belt, etc., and make his own table of wood to fit the saw. The saving effected, however, is not very great, and unless well made, it is better to purchase a ready-made bench.

A small bench of this nature will require an engine of from six horsepower upwards to drive it, depending on the nature of the bench, size of the saw, type of timber, etc. Accessories can be obtained or made, to assist in moving the log over the bench in sawing, chief among these being wooden or metal rollers, which can be affixed to the sawbench table, and small log rests or carriages with their tops level with the table running on rails placed at either end of the bench. The sawing may be done at the felling site if a portable engine is available to drive the saw, otherwise it may be driven by the engine used for general farm purposes. When large amounts of timber are to be converted, it may be desirable to have larger and heavier machinery and a series of saws for breaking down logs and re-sawing the timber. Before purchasing a plant of this nature, it is well to be sure of a market for the products, and to obtain all information with regard to the most suitable types of machinery and equipment. The mill site should be chosen, and the mill planned in detail before any steps are taken to purchase equipment. Persons contemplating embarking on timber sawing and utilisation are advised to consult forest officers stationed in various parts of the Colony.

Whatever be the type of plant, it is essential that the saws should be well cared for. They should be regularly sharpened and set, and from time to time sent to a reliable person for hammering and general doctoring. A blunt saw

or one running improperly retards work, lowers efficiency, and may lead to a serious accident. The methods of sawing timber to eliminate waste present some difficulties which can only be overcome with study of the particular timbers being dealt with. Generally speaking there are two main ways in which timber may be sawn.

1. *Quarter Sawing.*—Simply saw the log radially into four sections, and after having done this, saw each section into the required dimensions.

2. *Plain Sawing* (on the back).—Simply commence on one side and slab the whole log; afterwards cut the slabs into the required dimensions. This is the commonest method, and the one most applicable to many species, especially to rapid grown, immature eucalypts. These latter in growing set up stresses, which are relieved on felling, causing the logs to split before drying has a chance to take place. So rapid is this splitting in some cases, that the logs may be useless for timber before they can be taken to the saw, and, further, in other cases they split ahead of the saw. These stresses may, if not too serious, be relieved by rapid conversion and careful sawing.

In the case of refractory eucalypts, a method found to give good results is to take off a flitch from one side and successively turn the log after each cut. This method, of course, needs considerable handling, and consequently increases costs. The labour of handling may be reduced by taking two or more flitches before turning the log.

In the conversion of rapid grown, immature eucalypts in this Colony, there must always be certain losses due to the inherent stresses set up in their very rapid growth. It is doubtful if this defect can be measurably decreased by careful conversion methods. The solution seems to lie in the growing of the trees. Plantations should be kept dense, and the growth of the trees in early youth retarded as much as possible. By doing this, stronger and better quality timber without these stresses will be produced. Certain species such as *E. rostrata*, *E. tereticornis*, etc., which are slower growing, do not seem to be so prone to these stresses.

The conversion of timber may appear difficult at first. With experience, however, working on sound lines and

studying the correct methods of procedure, there is no doubt that it can be developed into a profitable side-line on the farm.

It is well to remember that it is wise to work on sound lines from the beginning, and thus save timber, labour and expense. Once the timber is felled it may be too late to obtain advice, therefore make sure of all doubtful points before commencing operations by obtaining the advice of an experienced person. Every assistance possible will be given by the officers of the Forest Service, to whom applications for advice may be made on any points dealing with the marketing and utilisation of timber and forest products.

Salisbury Experiment Station

FOR SALE.

KUDZU VINE CROWNS.

A limited quantity of kudzu vine crowns will be available for sale during January at the following rates:—

Large crowns	6d. each.
Small crowns	3d. each.

Prices are carriage free to any station or siding in Southern Rhodesia.

Purchasers are recommended not to plant small crowns, except on land which can be irrigated. Orders with remittances should be addressed to the Chief Agriculturist, Department of Agriculture, Salisbury.

Mycological Notes.

FURTHER EXPERIMENTS ON THE CONTROL OF WHITE MOULD (*ERYSIPHE CICHORACEARUM* DC.) OF TOBACCO, 1927-28.

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Plant Pathologist.

Preliminary experiments on the control of white mould in tobacco carried out at the Tobacco Experiment Station, Salisbury, during the 1926-27 season (1) showed that under the climatic conditions prevailing at the time complete control of the disease could be obtained by the application of sulphur to the soil at the rate of 40 lbs. per acre, as compared with infections of 43 and 57 per cent. in untreated plots. It was further found that if "vine sulphur" were used, no deleterious effects upon the cured leaf could be detected. In view of the importance of the disease in Southern Rhodesia and the necessity for cutting down working costs to a minimum, it was deemed advisable to continue this investigation and to compare the results obtained by the use of sulphur with those given by the generally recognised method of priming the lower leaves, which is known to check the disease. At the same time it was considered desirable to seek information on the effects upon yield of the removal of some six or eight leaves from the plant, since divergent views are held by the farming community on this subject. Consequently, experiments were again laid out at the Tobacco Experiment Station to include small dressings of sulphur, high priming alone and high priming in conjunction with dressings of sulphur. The results of the experiments form the subject of these notes.

Experimental Data and Results.—Five plots of half an acre were each divided into four equal plots of ⅛th of an acre. Three such sub-plots were given one of the following treatments and one was used as a control, all receiving an equal application of fertiliser. The treatments were as follows:—

A. Lower leaves removed to a height of from 10 ins. to 15 ins. from the ground, according to the size of plant, so as to allow of "topping" down to 9 or 10 large leaves.

B. Same as A, but receiving a dressing of sulphur to the soil at the rate of 20 lbs. per acre.

C. Unprimed plants and 20 lbs. per acre of sulphur.

D. Unprimed plants and 40 lbs. per acre of sulphur in two dressings of 20 lbs. each.

E. Unprimed plants and 60 lbs. per acre of sulphur in two dressings of 40 lbs. and 20 lbs. each.

Control plants were untreated and unprimed except for the removal of seed-bed leaves, which is the usual method practised in the Colony.

Regular observations were kept upon the growing plants and, with the appearance of white mould, counts were made of infected individuals, which were marked in their correct positions on a chart so that a general idea of the incidence of the disease could be obtained at a glance.

Climatic conditions were unfavourable for the growth of the crops owing to the prevalence of overcast, cool weather and an abnormally heavy rainfall, but the same conditions also inhibited the development of white mould to such a degree that the disease would be regarded as negligible by the local farmer. Although the disease did not *develop* to any great extent, yet its incidence did not appear to be checked by the climatic conditions prevailing, as is instanced by a comparison of the counts of infected plants which occurred in control plots with those of the previous season's experiment (1). The reasons for the failure of the disease to develop will be discussed later in conjunction with meteorological and other data, it being desirable first of all to record experimental results.

TABLE I.

Total Number of Infected Plants in Treated and Untreated Sub-Plots.

Treatment	Total plants per plot.	Infected plants per plot.		Remarks.
		Treated. Average of 3 sub-plots.	Control.	
A	620	88	398	Normal growth
B	620	26.5	378	do.
C	620	194	198	Treatment not effective
D	620	56	185	Poor growth
E	620	82	153	do.

It will be noted that there is a wide variation in the number of infected plants in the control plots, which can be explained by the fact that there existed a considerable difference in the fertility of the soil in the only land available for the experiment, and the plants in C, D and E plots did not make good growth. This, in effect, would be equivalent to a certain degree of priming, which, in sub-plots A, is seen to check the disease considerably. Fortunately, the soil became progressively poorer from plot to plot, and a fairly even stand of plants was obtained in each series of sub-plots, so that it is possible to make a comparison between each set of treated plots and its corresponding control plot. Bearing this in mind, it can be seen that treatments A and B, namely high priming and high priming plus 20 lbs. per acre of sulphur, were highly effective in preventing infection by white mould. Sulphur applied at the rate of 20 lbs. per acre on unprimed plots gave apparently no check, but larger dressings again controlled the disease. It must be stressed that these high figures give no indication of the degree of infection of the individual plant; they merely emphasise the potential dangers of the disease should weather favourable for its development

prevail. Under given climatic conditions, white mould may spread so rapidly as to affect all leaves upon a plant within a week or ten days, therefore the presence of 398 infected plants out of a total of 620 might well be viewed with alarm.

Meteorological Factors.—In view of the complete control which was obtained in the previous experiments (1) by the use of sulphur, it will be of interest to examine the conditions which allowed of infection varying from 4.3 to 31.3 per cent. in plots receiving similar treatment. The crop under consideration was planted and matured some two weeks later than that of the previous season, so that it is necessary to compare meteorological data on this basis. In 1927-28, between the 8th and 12th of February, 2.17 ins. of rain fell, and five days later white mould was observed in the control plots. Sulphur had been applied seventeen days previously, yet no infection of treated plots occurred. Then followed a period of nearly a month without any further precipitation, during which time a steady increase took place in the development and spread of white mould in the untreated plots. During the 1928-29 season a spell of rainless but overcast and cool weather was followed by 1.35 ins. of rain between 22nd February and 1st March. Four days later white mould was reported for the first time and counts made in all plots. Sulphur was applied on 13th February, which roughly corresponds with the previous year's experiments. Up till now the climatic conditions during the two seasons were almost identical, but from 5th to 18th March, 1929, a total precipitation of 4.21 ins. on 10 days was recorded, and this was followed by dry, warm weather. Seven days later a second count was made of infected plants in both treated and untreated plots. The first counts, which were made on 5th March, revealed a rather large number of infected plants in control plots, or those which had received 20 lbs. per acre of sulphur without priming, but few in the remaining plots. A second count was made on 25th March, the results of which are given in Table I., and a few days later reaping commenced. A comparison of the two sets of figures shows that of the total number of diseased plants recorded per treatment, the controls contained one quarter of their total at the first count, series C contained 1-6th, and

series A, B, D and E averaged 1-25th (from 1-16th to 1-39th), that is to say, infection made steady progress in the controls and series C, but was checked for some time in those plots which had received extra priming or sulphur in quantities greater than 20 lbs. per acre. The reasons for relatively high late infection in treated plots are not known fully, but two factors are of undoubted importance. Firstly, that the sulphur could not be detected in the field after a few days of continuous rain, owing to water lying in the furrows and covering the powder, secondly, surface wash which removed it, and thirdly, by the time the protection afforded by the sulphur had been removed, the plants had reached a fairly advanced stage of maturity, when, according to local observations, they become more susceptible to attack. Similarly, the factors which govern the development of white mould are still somewhat obscure, but it is fairly clearly demonstrated that a period of continued rainfall will prove inhibitory; this is in agreement with the findings of other workers (2). Dull weather with light showers also checks the fungus, possibly by retarding spore production and washing spores from the air on to the soil.

Effects of Priming on Yield.—The extent to which the operation of priming is beneficial to the plant has been a matter of controversy for some time. It is claimed that the removal of the lower leaves retards the growth and ripening of tobacco, reduces yield and quality by eliminating the largest leaves, also the fact that priming is not a recognised cultural operation in America is considered to be conclusive evidence against its desirability. Local conditions, however, render these arguments void, because in the first place white mould is not a serious menace to American tobacco growers; secondly, there is no local market in Southern Rhodesia for sand "lugs"; thirdly, one of the principal faults in Southern Rhodesian tobacco is lack of "body," due to leaving too many leaves on the plant, and fourthly, there is no reduction in yield of marketable tobacco if priming is carried out in the manner recommended by this Department. It is in connection with this last statement that the following figures will be of interest.

A record was kept of the amount of green leaf reaped from each sub-plot. Each lot was cured and graded separately, after which another set of weighings was made. Unfortunately it was not possible to arrange for the samples to be valued by a buyer, but all scrap tobacco was discarded and only leaf of sufficient value to repay handling was retained.

TABLE II.

Yields of Green Tobacco from Primed and Unprimed Plots.

(Mean of Five Plots).

Treatment.	Green leaf. lbs. per acre.	Percentage of Wastage.
Primed	658.8	49.0
Unprimed	583.2	54.0

It will be noted that there is a very high percentage of scrap tobacco throughout the crop, which was due to the climatic conditions favouring the development of angular spot,* blackfire† and frog eye.‡ White mould itself was responsible for only a small loss, but, as has already been pointed out, it was of great potential danger. There is, however, an increase in wastage of 5 per cent. in unprimed plots, principally due to infection by angular spot and frog eye, which was checked by priming.

The yield figures are of interest in view of the opinions held by a number of growers. There is a considerably greater yield of green leaf from primed plots than from unprimed, and this difference increases in graded leaf. So that from the points of view of both general disease control and maintenance of yield it appears to be desirable to remove sufficient leaves from the base of the plant to allow of thorough aeration. In practice the removal from the field and destruction of primings showing symptoms of infectious disease will also be found to be essential in successful tobacco growing. Further investigations regarding the use of sulphur are at present being carried out, and recommendations with regard to its use will be made when these experiments have been completed.

* *Bacterium angulatum* Fr.
† Undetermined physiological disorder.
‡ *Cercospora nicotianae* E. and E.

Acknowledgments are due to the Meteorological Branch for rainfall returns and to the Chief Agriculturist for supplying field workers to assist in the experiments.

SUMMARY.

1. A further series of experiments has been carried out to test the value of sulphur applied to the soil as a fungicide to control white mould of tobacco.

2. Small quantities of sulphur used in conjunction with high priming of plants markedly checked the incidence of the disease, but the same quantity of sulphur was useless if plants were unprimed.

3. High priming without the use of sulphur was also efficacious, but did not give quite as good control.

4. High priming increased the yield of both green and cured leaf.

5. Owing to climatic conditions being unfavourable to the development of white mould, the lethal action of sulphur could not be fully tested.

6. Further experiments are being conducted this year.

REFERENCES.

1. Hopkins, J. C. F.—"Preliminary Experiments on the Control of White Mould of Tobacco," *Rhodesia Agricultural Journal,* Vol. XXV., No. 12, 1928.

2. d'Angremand, A.—"Bestrijding van Veldschimmel (Oidium spec.) in de Vorstenlanden," *Proefstat. voor Vorstenlandsche Tabak,* Meded xlix.

Short Specifications for Reinforced Brick Tanks up to 20,000 Gallons Capacity.

By R. Hamilton Roberts, B.Sc. (Eng.), Assistant Irrigation Engineer.

1. *Dimensions.*—

Water depth, 6 ft.

Diameter 10,000 gallon tank, 18 ft.
15,000 gallon tank, 22 ft. 6 in.
20,000 gallon tank, 26 ft.

Thickness of walls, 9 in.

Width of foundations, 14 in. brickwork (four courses minimum).

Thickness of floor, 3 in. with ½ in. cement plaster.

Reinforcement: No. 8 gauge wire (high tension).

Vertical Spacing of Reinforcement Rings:—

Height from bottom of tank.	10,000 gallon tank.	15,000 gallon tank.	20,000 gallon tank.
First 24 inches ...	16 Rings 1½ in. apart	24 Rings 1 in. apart	24 Rings 1 in. apart
Next 24 inches ...	12 Rings 2 in. apart	12 Rings 2 in. apart	16 Rings 1½ in. apart
Top 24 inches ...	6 Rings 4 in. apart	8 Rings 3 in. apart	8 Rings 3 in. apart

2. *Quality of Bricks.*—Bricks are to be hard, well-burnt, of good colour and uniform. "Frogged" bricks are to be preferred.

3. *Mortar.*—All brick-work in walls and foundations is to be laid in cement-mortar, composed of 1 part of cement to 4 of sand by volume. It is important that the sand should

be clean, and if earthy or organic matter is present the sand should be well washed.

The brick floor may be built of brick-on-flat laid on a sand bed ½ in. thick. The earth surface on which the floor is to be laid should be truly level and well rammed to make it uniform in hardness. The bricks may be laid dry, and "grouted" with 1 : 4 cement-mortar. A plaster coat of 1 : 3 cement-mortar is to be applied later to a thickness of ½ inch.

No attempt should be made to join the floor to the wall, but a space of 2 to 3 inches should be left, and filled with well-puddled clay immediately before the tank is filled with water.

4. *Method of Building Wall.*—The principle of the type of wall recommended is that it should consist essentially of an inner 4½ in. wall and an outer 4½ in. wall, the wire reinforcing rings being in the mortar between the two. The method to be adopted is as follows:—The inner wall should be built to a height of three or four courses, and the wire rings strung round at a moderate strain at the proper spacing, and properly jointed. The outer wall is then built up to the same height, taking care that the mortar joint between the two walls (in which lie the wire rings) is completely sound and has no air-spaces. On top of the low wall built so far a single course of "headers" (*i.e.*, bricks laid at right-angles to the wall) should be laid. In this course there can be no wire reinforcement, and consequently the wires should be spaced a little closer than given in the table in order to use the correct total number of wires in the "stretcher" courses.

This method of building is to be used throughout the height of the wall, three or four courses of "stretchers" being followed by one course of "headers." The object of the "header" course is to bind the inner and outer walls together.

In order to obtain good cohesion between the bricks and the mortar it is important that *the bricks should be thoroughly soaked before being laid;* mere wetting is not enough, and paraffin tins of water should be set at intervals all round the tank site, and the bricks placed therein some hours before being required.

The wall should be built, say, two courses of brick above the "full supply level" required, and at the full supply level a pipe should be fitted to get rid of overflow water. This pipe should not allow the water to drop on to the foundations, but should be bent at right-angles to reach the ground level, and the water led clear of the foundations by a cement channel.

5. *Reinforcing Wire.*—Plain fencing wire (No. 8 gauge) will be found easier to work with than barbed wire; it is important to use good quality high tension wire. The joints in the rings should be made by "lapping" the ends of the wire about 8 inches through a "ferrule," 4 inches long, of closely twisted baling wire which is slipped over the lapping ends before the wire is strained. When the ferrule is in position the wire is pulled tight to a moderate strain, and the ends bent backwards over the ferrule.

6. *Plaster.*—The inside of the wall and the floor are to be plastered to a thickness of ½ inch with 1 : 3 cement plaster. The plastering should be evenly applied, and must be kept continuously damp for 10 days.

7. *Outlet Pipe.*—This pipe should not pass through the brickwork, but through a concrete block 9 inches square. In order that this block should not interfere with the reinforcing wires, it is recommended that an opening 9 inches square should be left in the brick walls and the pipe pushed through after the wires are in place. The opening can then be filled with concrete. An alternative is to pass the pipe through a concrete block set in the foundation. A depression must then be formed in the floor to the level of the pipe, and this depression will prove useful when cleaning the tank.

8. *General.*—It is essential that the wall shall be truly circular and vertical.

Four heavy posts projecting 7 feet above ground should be set at the corners of a square a few feet outside the tank site. Guy wires are strained over these posts, and their intersection marks the centre of the tank. A ⅝ in. x 4 ins. bolt is fastened at this intersection to hang vertically and to fit inside the top end of a 7 foot length of ¾ in. piping, which pipe fits at its lower end over an iron peg driven well into the ground. This peg must be vertically below the ⅝ in. bolt.

This pipe forms an axle for a light wooden framework, the length of which equals the exact inside radius of the wall. The end of this framework is formed by a vertical piece of deal 6 feet long resting at its lower end on the foundation, which must be perfectly level. This framework can be rotated about its axle, and the piece of deal will mark out the exact circle for the wall. A stout washer will be needed on the iron peg to allow the pipe to turn freely, and it will help matters if a light hoop iron skid be attached to the foot of the deal plank so that it can travel easily on the foundation brickwork. The level of the washer must be the same as the top of the foundation.

Alternatively, a true circle may be drawn on the top of the foundation by means of a pencil on the end of a cord fastened to the centre peg, and the walls merely built to this circle and kept plumb by means of a spirit level.

The tank should not be filled for at least 10 days after completion, and meanwhile the cement work must be kept continuously damp.

If the tank is to be used for watering stock, a trough may be built round the outside wall and kept filled to a definite level by a 1-inch pipe branching off the main outlet and controlled by a ball valve.

The area round the tank should be protected from the trampling action of cattle by being stone cobbled.

9. *Approximate quantities of material* are as follows for the most important items, but not including the trough or piping:—

Material.	10,000 gallon tank.	15,000 gallon tank.	20,000 gallon tank.
Bricks ...	6,000	7,500	9,000
Cement ..	19 bags	24 bags	29 bags
Sand ...	5 cubic yards	6.5 cubic yards	8 cubic yards
No. 8 wire ...	700 yards, in lengths of 59 feet 8 inches	1,100 yards, in lengths of 73 feet 8 inches	1,400 yards, in lengths of 84 feet 8 inches

Irrigation Notes.

By C. L. Robertson, B.Sc., A.M.I.C.E.,
Irrigation Engineer.

[Readers will welcome the re-appearance of these "notes," which record the activities of the Irrigation Branch of the Department of Agriculture. In his present contribution the Irrigation Engineer produces figures showing the market which exists in the Colony for locally grown produce, and we trust what is written will have the effect of focussing attention upon a matter of prime importance to farmers with the necessary irrigation facilities. The particulars of the possibilities of the Umshandige Gorge project will, we feel sure, be read with great interest.—Ed., R.A.J.]

Markets for Irrigable Crops.—The following statement taken from the Government Statistician's report for 1928, showing a comparison between the quantities of irrigated crops grown in this Colony and those imported and exported, is of interest in view of the fact that farmers who may have promising irrigation schemes on their properties frequently state that irrigation is all very well, but there is no market available for any irrigable crops they may grow.

	Grown in S. Rhodesia, 1928.	Imported into S. Rhodesia, 1928.	Exported from S. Rhodesia, 1928.
Potatoes (150 lb. bags)...	14,943 (winter crop) 41,791 (summer crop)	29,658	12,259
Onions (120 lb. bags) ...	2,967	12,948	3,311
Wheat (200 lb. bags) ...	6,887	85,400	34
Oats (150 lb. bags) ...	881 (winter crop)	3,708	756
Barley (150 lb. bags) ...	3,330	210	3,037
Value in pounds sterling	£28,860	£120,000	£17,250

The value of these commodities is the declared value for exports and imports, whilst the value of the product grown in Southern Rhodesia is assessed on the export price, the value of the summer crop of potatoes not being included in the total sum obtained for crops grown in Southern Rhodesia. From this it will be noted that less than 25 per cent. of the demand for crops which are capable of being grown under irrigation in this Colony is actually met by the locally grown product. It is of interest also to note the difference between the declared values of these articles on import and export:—

	Import value per bag. s.	d.	Export value per bag. s.	d.
Potatoes	14	0	16	6
Onions	13	2	21	3
Wheat	20	7	27	6
Oats	13	7	15	0
Barley	20	0	19	6

On the basis of the export values and the yields in 1928 the following is the average cash return per acre for the different types of crops grown under irrigation:—

	Cash return per acre.
Potatoes	£12 12 0
Onions	43 15 0
Wheat	2 18 0
Oats	1 13 0
Barley	6 7 0

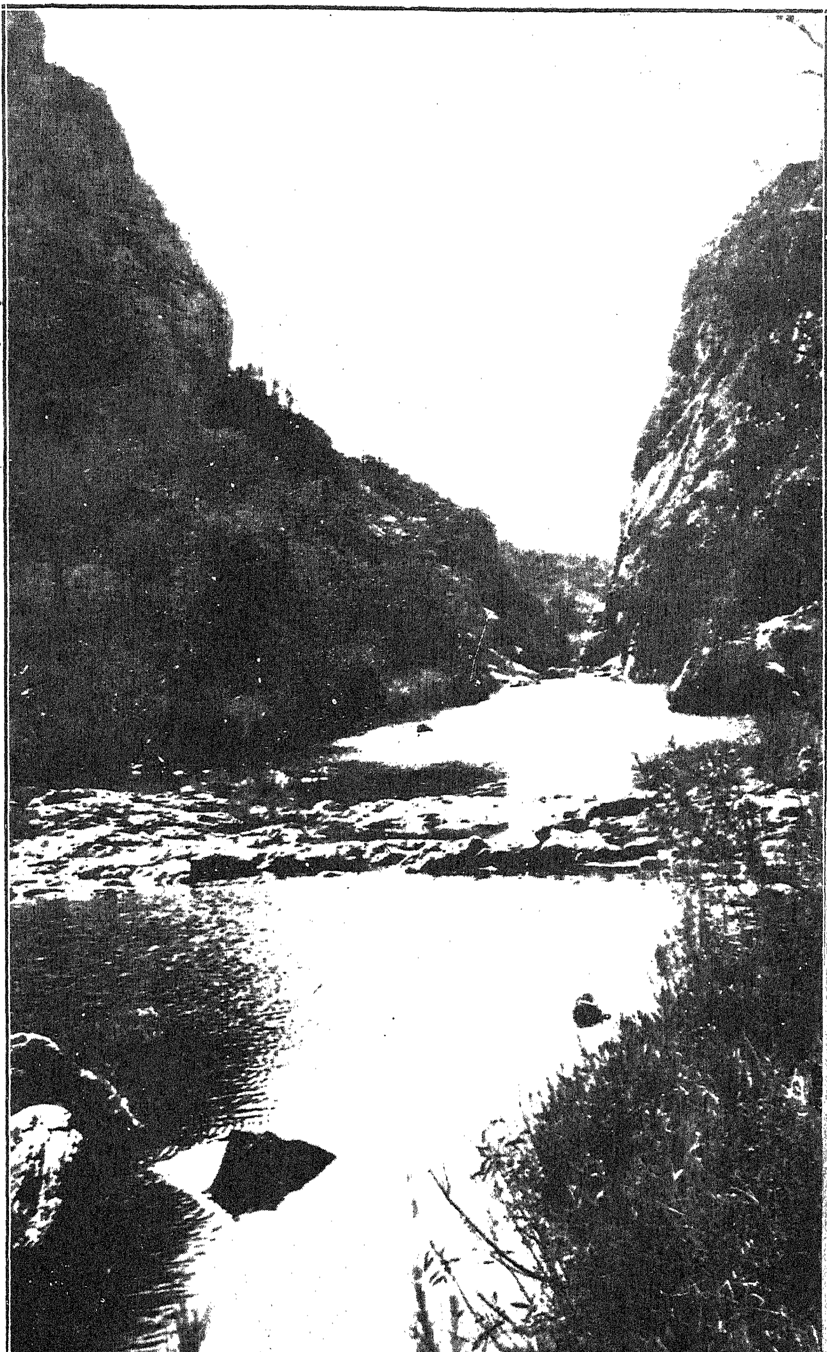
The low return shown from wheat and oats is almost wholly due to the fact that the great proportion of these crops are not really grown under properly controlled irrigation schemes, but on wet "vleis." The average yield of wheat and oats being only 2.1 and 2.2 bags respectively per acre in 1928.

In this connection attention is directed to the article in the *Rhodesia Agricultural Journal* for February, in which it is shown that with suitable soil and proper cultural treatment yields of wheat up to 10 bags per acre are procurable, which would render this crop an economical proposition when grown under irrigation (apart from pumping schemes).

In addition to the irrigated crops grown in Southern Rhodesia given in the first table, there is also a considerable area of green fodder crops under irrigation for the purposes of stock feed, and further, there was an area of 2,125 acres of citrus trees in bearing under irrigation which on the declared value of citrus exported yielded a return of £41 4s. per acre. Besides the import of wheat (in grain), amounting to £87,890, the imports of other wheat products in 1928 amounted to £21,900, while the exports of similar products totalled £24,380.

The following schedule shows that although there has been a considerable increase during the last four years in the local demand for the three main products, viz., wheat, potatoes and oats, this increase has been wholly met by imports and not by increased local production.

	Locally grown.				Total crop, local plus
	Summer. Per cent.	Winter. Per cent.	Imported. Per cent.	Exported. Per cent.	imports. Bags.
Potatoes—					
1924	54	38	8	9	62,730
Average, 1924-28	50	28	22	14	72,040
1928	48	17	34	14	86,390
Wheat (in grain)—					
1924	11		89	0.6	48,370
Average, 1924-28	14		86	0.2	63,215
1928	8		92	0.04	82,290
Oats—					
1924	45		55	7	1,473
Average, 1924-28	27		73	14	3,440
1928	19		81	16	4,589



During the period 1924-28 the declared import values of these articles per bag varied as under:—Potatoes, from 9s. 3d. in 1925 to 21s. 6d. in 1926; wheat, 20s. 6d. in 1924 to 24s. 6d. in 1927; oats, 9s. 8d. in 1925 to 13s. 7d. in 1928. It is realised that the period 1924-28 coincided with the tobacco boom, when the lucrative prospects offered by this crop tempted farmers to neglect the opportunities offered by mixed farming. This may be one reason why the expansion in the local market has not been of benefit to the local growers or alternatively there may be defects in the local marketing organisation. These few notes are put forward in the hope that attention will be directed to this subject.

Umshandige Gorge Project.—In the issue of the *Rhodesia Agricultural Journal* for November, 1928, attention was drawn to the possibilities of a large irrigation scheme being economically feasible at the Umshandige Gorge, in the Victoria district. Opportunities for a full investigation of the scheme did not occur until the end of last year, when the reconnaissance survey party were detailed to carry out this work. The scheme would consist essentially of a large storage dam at the head of the gorge, a diversion weir at the end of the gorge, together with high level and low level furrows on both banks of the river to command irrigable land on the Inyanda Block.

Owing to the near approach of the rainy season the survey party concentrated on the investigation of the storage capacity of the proposed dam, and by rapid and efficient work were able to complete this portion of the survey in the six weeks at their disposal. The further investigation regarding the cost of the distribution canals and the exact area of land commanded will be completed at an early date, as the survey party will be taking the field again early in April. The results of the survey to date are very much more promising than was originally anticipated.

It is found that a dam 108 feet in height would impound 30,000 acre-feet, i.e., almost twice the capacity of the Mazoe Dam, which has previously been regarded as one of the best dam sites in Southern Rhodesia, at a cost of not more than £1 per acre-foot stored, as compared with Mazoe Dam, where the cost was £6 per acre-foot stored. The catchment area above the dam is practically the same in both cases, viz.,

130 square miles, but in the case of Mazoe the dam can be relied upon to fill in the great majority of years, whereas on the Umshandige catchment the rainfall is very variable in successive years, and on an average the dam can only be relied upon to fill in every third year. On this conservative basis, and allowing for seepage and evaporation losses, with absolute minimum flood inflow in two successive seasons of low rainfall, the dam can be relied upon to store sufficient water for the irrigation of 3,000 acres.

From a preliminary reconnaissance of the area it appears certain that there are at least 3,000 acres of suitable irrigable land below the dam. This land is practically all unalienated Crown land, which is situated within a distance of 20 miles from Victoria. As the summer rainfall in this area is very erratic, the provision of an assured supply of water will guarantee the growth of crops even in the worst of seasons, which is not possible under present conditions.

It is probable, therefore, that this scheme may mature into a practical proposition, as it will undoubtedly very materially improve farming prospects in that portion of the Colony.

Agricultural Costings at the Gwebi Farm.

MAIZE AND GREEN MANURING.

By H. G. Mundy, Dip.Agric., F.L.S., Chief Agriculturist, and J. Hick, Accountant.

In this issue of the Journal are presented the costs of maize growing on the above-named farm in the season 1928-29, together with the cost of green manuring certain areas of land (a) with dolichos beans (b) with Sunn hemp.

Maize Costs.—The acreage under maize was 415 acres, of which 60.7 acres were treated with eight tons of farm manure per acre, valued at 10s. per ton; 83½ acres received 200 lbs. of bone and superphosphate per acre, 110.3 acres received 150 lbs. bone and superphosphate per acre, and 20 acres received 200 lbs. of rock phosphate per acre. The total maize yield was 3,760 bags, or an average of 9.06 bags an acre.

The figures appearing in the costings against artificial fertiliser are the proportion of the cost charged against that particular crop. The practice which has been adopted is to charge 70 per cent. of the cost against the crop to which the fertiliser is directly applied and 30 per cent. against the crop which follows on that land the next season.

Seed maize is charged at 30s. per 200 lbs.

The salary and farm allowances of the manager are allocated over all farming operations in proportion to the total expenditure on those operations. The salary and allowances of the farm assistant are allocated to each crop in the pro-

portion which the acreage under that crop bears to the total acreage under cultivation.

Under the heading depreciation of implements, etc., in each statement is included not only depreciation, but also maintenance of all implements and plant employed in the operations under consideration.

It will be noted that of the maize, part was planted in check rows by hand labour and part drilled in rows with the planter. Hand planting (a labour force of 70 to 100 natives is employed on the farm) cost 1s. 8d. an acre as against 5d. an acre for drilling, but owing to the better stand of plants obtained, hand planting produced on an average a yield of 1 to 2 bags an acre more than machine planting. Thinning of the maize by hand from three to four down to two plants per hole added a further cost of 3d. an acre to the hand planting method.

Shelling of maize is effected with a Sunshine sheller operated by a portable Lister engine, the outfit being moved to convenient centres as required. The ears are husked before shelling.

The low figure for bags, twine and sewing, namely, 1s. 0.59d. per bag, is explained by the fact that second-hand bags are used for all maize retained on the farm for home use. The farm granary and the railway siding average about 1½ to 2 miles distant from the arable land.

The actual cost per bag of producing the maize crop during the season under consideration was 5s. 11.85d., but this figure does not take into account the residual value of fertilisers, etc., applied and green manuring carried out in previous years. The precise residual value of these operations is not available owing to lack of dependable records for previous years, but based on the actual carry-over, under these headings, from the season 1928-29 to 1929-30, a further sum of about 1s. per bag should be added to the total cost of production price, bringing this in round figures to 7s. a bag.

A point of interest in all three tables is the fact that ox labour represents so very small a percentage of the total costs in each case. It is unfortunate that this percentage for ox labour cannot be compared with the percentage which would be chargeable had a tractor been employed for draught

purposes. The feature is one, however, which should not be overlooked by those farmers who are tractor owners.

Green Manuring.—Turning to the tables dealing with the costs of green manuring, it will be seen that the cost of using dolichos beans for this purpose is almost identical with the cost of using Sunn hemp. Sunn hemp seed at 60s. per 200 lbs. is twice the cost of dolichos bean seed (30s. a bag), and nearly twice as much Sunn hemp seed is sown per acre. On the other hand, Sunn hemp when sown sufficiently thickly for green manuring requires no cultivation, since its rapid growth largely smothers the weeds. Dolichos beans, on the contrary, must be cultivated at least twice, otherwise quick growing weeds will gain the mastery over the green manure crop. It is considered that by growing his own Sunn hemp seed the farmer could reduce the cost of green manuring with this crop by at least 7s. an acre.

Consideration of statements C of each of the green manuring tables shows that under the system adopted at Gwebi, namely, that of spreading the cost of the green manuring over the three following crops, the cost of this operation against the first crop will average about 17s. an acre, the cost against the second crop about 12s. and the cost against the third crop about 5s. an acre. It has repeatedly been demonstrated in Southern Rhodesia that one good green manuring with Sunn hemp or dolichos beans every fourth year, together with an application of 400 lbs. of phosphatic fertiliser given in two dressings over the same period, will maintain the average maize land of the Colony in a good state of fertility, and normally capable of returning an average yield of at least 10 bags an acre. Assuming the cost of the fertiliser to be 30s. over the four years and the cost of the green manuring 34s., the total additional cost will be 64s., or, say, 22s. per acre per annum on each of the three following maize crops. For the present it must be left to the farmer to decide for himself whether the increased yields likely to be obtained from this system of cropping and fertilising would adequately repay the additional expenses involved. There are many experienced and practical farmers who hold that such a system of arable land management would annually increase their maize yields over the average by at least 50 per cent. to 75 per cent.

Parasitic Gastritis of Cattle.

By Ll. E. W. Bevan, M.R.C.V.S., Director of Veterinary Research, Southern Rhodesia.

Since the "Notes" on the above subject were written, evidence has accumulated which indicates that parasitic gastritis of cattle is far more prevalent in this Colony than was hitherto suspected, and it is probable that many of the deaths which occur during the dry season and are attributed to "poverty" are directly or indirectly due to the so-called "wireworm," a parasite which infects not only sheep, but also cattle.

The symptoms of this disease are lack of condition, dry skin and staring coat, general "tucked up" appearance, collection of fluid in the tissues beneath the angles of the jaw, or, as it is sometimes called, "bottle jaw," diarrhœa and unsteady gait. Eventually death from anæmia, emaciation and weakness results.

It is generally during the winter months, when grazing and water are scarce, that fatal results occur, but affected animals are also noticeable during the summer months by reason of the fact that notwithstanding an abundance of nourishment, when most animals are sleek and fat, they do not improve like the rest of the herd, but remain thin and unhealthy in appearance.

If taken in time, this disease can be successfully treated, but it is unwise to wait until the animal is *in extremis* and the natural grazing cannot provide sufficient nourishment to assist recovery. If treatment is to be applied it should be during the period when grazing is good and sufficient food and water are available to build up the weak and emaciated animal.

Experiments conducted by the Veterinary Research Department indicate that the Union Government wireworm remedy recommended for the treatment of wireworm in sheep is equally efficacious for cattle. The appropriate dose for medium-sized cattle is approximately a level teaspoonful of the dry powder placed on the back of the tongue once every three weeks. Preliminary starvation does not appear to be necessary, but the treated animal should be kept from water some hours before and after treatment. The interval is based upon a knowledge of the life cycle and period of development of the parasite. It is recognised that in dealing with large herds under ranching conditions individual treatment may be impossible, but since the recognition of the prevalence of the disease there has not been sufficient time to work out a system suited to such conditions. Experiments to this end are being carried out, but in the meantime it is thought desirable to draw attention to this menace which affects large and small herds alike.

The chief object of this "Note," however, is to introduce a method which the writer has devised for the detection of this disease at a time when treatment can be best applied, namely, the summer months when grazing is good. If during that period certain animals are found to be unthrifty and fail to make condition when other animals are fat and healthy, a small quantity of their dung should be collected in a special tube containing a preservative, which will be forwarded from the Veterinary Laboratory, Salisbury, free of charge, to those applying for it.

By this method material will arrive in a suitable condition at the laboratory, where it can be microscopically examined for the eggs of the worms, upon which a diagnosis can be based.

It is confidently believed that by the early detection of the disease and the administration of suitable remedies many deaths will be prevented.

The Importance of Destroying Maize Trash after Reaping.

By the Division of the Chief Agriculturist.

Each year brings fresh evidence that the urgent need for the thorough destruction of all maize trash after the crop is reaped is not yet properly appreciated by many farmers. The results of neglect to carry out this operation are evident in the increasing damage to the maize crop by stalk-borer and diplodia, in the poor stands of plants obtained and in the bad work done by planters and cultivators.

The reasons for this need to destroy all maize rubbish may be given under three headings:—

The Effects of Surface Rubbish on Planting, Harrowing, Cultivating, etc.—If the stalks and long stumps of the maize crop are left on the land they do not rot down for many months, and cannot be covered by the plough. The result is that many are found on or protruding through the surface of the land when the new crop is to be planted, and they then seriously interfere with the action of the planter, causing it to jump out of or skid over the ground, thus giving rise to uneven dropping of the seed and planting at irregular depth. Much of the seed may not be covered at all, and bad stands result. Subsequently the work of the harrows, or the cultivators between the rows of the crop, is also interfered with by the unrotted pieces of stalk and root, and these implements are thus prevented from efficiently killing the weeds.

The proper use of the drag-harrow over the young maize is at once the quickest, least expensive and most effective method of overcoming weeds, and it is an implement which should be much more generally used than is the case to-day. Some of the best maize farmers in the Colony drag-harrow

their maize lands both after as well as before the maize is above ground, as many as three or even more times, and are then very little troubled by weeds later in the season. But loose stumps and stalks of old maize plants will often make it impossible to utilise a drag-harrow in this way for cultivation, owing to the implement becoming constantly clogged with such rubbish, and many young plants being in consequence pulled out of the ground.

Effect on the Spread of Diplodia.—Diplodia is causing more loss to the maize farmer in this Colony to-day than can easily be estimated, and unless proper steps are taken to prevent it, this serious disease of the maize plant must inevitably spread and grow worse year by year.

The chief source of infection is the presence in the maize lands in spring of old maize stalks and stubble. It is on this rubbish that the disease winters, and is carried over from the previous maize crop to infect the new crop, in the form of what may be called "winter spores," contained in tiny black spore cases or *pycnidia*, which are to be found in great numbers on the old maize trash.

The destruction of all maize rubbish by burning is therefore of the greatest importance for the prevention of the re-infection of the new crop, and this should be thoroughly and consistently done. When stooking the crop, the stems of the maize may be cut by a sharpened hoe, just below or on the ground level. The same should be done where stooking is not the practice, but when the stalks have been partially fed down by cattle. All the stalks, leaves and husks which are not eaten by the stock should be carefully and thoroughly destroyed by burning. Unless this work is efficiently and consistently done each year, the farmer must face the certainty of a yearly increasing loss of grain, and the relegation of much of his crop to a lower grade, when it comes under the eye of the grain inspector.

Effect on the Spread of Stalk-borer.—It is the opinion of the officers of this division that the amount of damage done by the stalk-borer is showing a serious increase year by year. It is urgently necessary that drastic steps should be taken to prevent this damage as far as possible.

The larval stage of the stalk-borer largely winters in the stalks of the maize plant, and since many of the larvae are found in the stems of the maize just about ground level, it is essential that the plants should be pulled or cut off quite close to the ground after the cattle have been through the crop, or when the maize is stooked. The pest is causing much damage to the maize crop each year, and it is of the greatest importance that every farmer in the infested area should destroy all the old maize stalks by collecting and burning them in the manner described. If this is neglected, the stalk-borers will increase in numbers, and the damage done by them may become so great as to make it unprofitable to grow maize. The destruction by burning of all maize trash on his lands each winter before ploughing is a duty which each farmer owes not only to himself, but also to his neighbour.

Talks to Poultry Keepers.

SUCCESSFUL CHICK REARING.

By H. G. Wheeldon, Chief Poultry Officer.

The pivot point on which the success of a poultryman turns is his ability to rear the season's chicks. There is no doubt that, given a good brooder and correct management, it is simple to raise healthy, sturdy birds. Always be on the look-out as to whether the young stock would benefit or not by some little extra comfort or change, such as removing the brooders to fresh ground.

The growth of the chicks may be checked in various ways, viz., by excessive exposure to the sun or rain, by irregular, unsuitable or insufficient feeding, by over-crowding and lack of ventilation in the brooders, by neglect in supplying fresh, cool water regularly, by insanitary brooding or housing conditions and stale ground.

As a rule the brooding capacity of brooder devices is often rated much too high for practical purposes. Seventy-five or 100 newly hatched chicks may be placed in a brooder having an apartment 2 ft. 6 ins. square, but such a brooder is not adequate for raising this number of chicks to weaning age. Fifty or 60 chicks to be accommodated to weaning age are enough for one flock in any brooder this size. It would be much wiser for the beginner to place 25 chicks in the smaller brooders, such as a converted petrol box, for if more are placed in it there is almost certain to be some loss until the flock is thinned down to a reasonable number or below it.

When the chicks are first placed in the brooder give them a drink of water in a shallow receptacle. After this keep the water in a shady corner where they can have access to it at all times in a small run attached to the brooder; do not leave the water vessel for any length of time in the hover chamber where the chicks can spill the water and wet the floor and litter material. In addition to the mash food and grit, sprinkle a little oatmeal in a convenient place for the first feed. Feed this for the first two or three days in addition to munga or small grain or chick mixture, then discontinue the oatmeal and feed exclusively on the dry mixtures of mash and chick grain food. Bone meal, animal food and charcoal may be incorporated in the mash and chick-size grit may be placed in a small receptacle to be accessible at all times. Green food, finely cut, should be given early in the day and fed at regular intervals.

Watch the chicks closely the first few days to make sure that they do not crowd or bunch together during the day; this is an indication that they require warmth. Advantage should be taken of these occasions, especially in cold weather, to teach them the way to and from the brooder chamber, which is the source of heat in "cold brooders." Always provide plenty of ventilation, especially at night; never attempt entirely to close up the brooder chamber; the chicks must have an abundance of fresh air if they are to be reared successfully. Every day, if possible, air the interior of the brooders, and when practicable expose the under side of the hovers and the litter to the direct rays of the sun for at least a little while each day, and renew the litter as often as may be required. The brooders must be cleaned often and kept

clean. In this way the brooders will always be fresh and sanitary. Where chicks are confined in small enclosed wire runs attached to the brooders, remove the brooders and runs to fresh ground at least once a week.

After the brood has been weaned, thoroughly clean and disinfect the brooder in preparation for the next brood. At the end of the season also be sure to clean the brooders thoroughly before they are stored away for the following season.

When the chicks are ready to be weaned from the brooders, choose warm weather, if possible, and transfer them to coops with larger runs. Care should be exercised to see that they are comfortable the first few nights and additional protection given if required. Advantage should be taken to remove the cockerels from the pullets during this period. Each coop should accommodate double the number of chicks that were placed in the brooders.

What is now mentioned has been referred to many times before, but it is information that cannot be repeated too often, and the poultry keeper who realises the importance of these matters is not likely to have much trouble with the growing stock. Many pullets are ruined each year by the poultry keeper's interest waning, and the rearer must see that this does not occur on any account. Always remember that a check received at any time during the growing period may spoil an otherwise good pullet both for laying or breeding.

The longer live stock are kept, the more the old adage will be realised, "It is the little things that very often count." Do not be neglectful.

" Agricultural Research in 1928."

ROYAL AGRICULTURAL SOCIETY OF ENGLAND.
193 pages. Price 1/3. Post free.

The fourth volume of this annual summary of the scientific and economic research work in agriculture, not only at Home but abroad, in so far as Colonial and foreign results are of interest to agriculturists in this country, has now been issued. Started four years ago at the instance of the Research Committee of the Royal Agricultural Society, quite frankly as an experiment, the publication has now established for itself a definite place in the periodical literature of the farming industry. Farmers are naturally at a disadvantage, not only in interpreting the results of scientific work, but also in knowing where to look for them. They appear in a great variety of forms, in periodicals not always accessible to the farmer and couched in language not always easily understood by him. His work lies around him on his farm; he has neither the time nor always, in these days, the means to study a multiplicity of journals and pamphlets, and thus it happens that the results of research work are often too slow in reaching those who are most concerned to know about them. Collected from all available sources, put together by acknowledged authorities, in non-scientific language, the contents of *Agricultural Research* should be studied by all those who wish to keep themselves abreast of the times in modern agricultural practice.

It is impossible to do more than to give some indication of the subjects dealt with in the new issue. Mr. Mackintosh has some useful observations on dairy farm management, and the economics of the production of clean milk, and the establishment of a tubercle-free dairy herd. The question of taints and flavours in milk is also dealt with by him. Under the heading of "Agricultural Economics" Mr. Orwin deals with factors in the cost of various farm products, and this

section also contains a brief but useful summary of the economic position and the trend of events in the agricultural industry at the present time. In these days of high labour costs and low prices, the farmer is turning more and more to the use of machinery in the hope of increasing the output of labour, and the information contained in Dr. Owen's contribution on "Agricultural Engineering," dealing as it does, not only with the efficiency of old and well-tried implements, but also with new inventions such as those for rotary cultivation, the combine harvester-thresher, and the potato harvester, will receive close attention. Dr. Crowther, as would be expected, has much to say on recent work in "Animal Nutrition," and the recent development of knowledge on the nutritive value of grass at different stages of its growth will be found of particular interest. "Soils and Fertilisers" form the subject of a valuable review by Sir John Russell. A section on green manure and the limitations of its usefulness under varying soil conditions is of great practical value. The volume concludes with Sir John McFadyean's summary of the progress of "Veterinary Research" during the year, particular attention being given to the control of tuberculosis and that other scourge of the dairy farmer, contagious abortion.

For the assistance of students and others desirous of consulting original sources of information, each section of *Agricultural Research* concludes with a complete bibliography of papers quoted. The Royal Agricultural Society, it should also be noted, is continuing the sale of the volume at the reduced price of 1s. 3d. post free, in order to secure the widest possible circulation. To members of the Society it will be sent free on application.

Tobacco Cultivation in France.

No one in France is allowed to cultivate tobacco, or a substitute plant, or to import or manufacture tobacco, with out official authorisation. Permission is granted to cultivate tobacco only in certain departments where the soil is especially suited to the growth of the plant, mainly in south-western France, and to a smaller extent in the north-west and in the east. Each year a separate request for permission to raise tobacco must be filed by the tobacco growers with the prefect to their department, who in his reply will specify the area authorised, the number of plants per acre, and, later, the date for delivery of the tobacco to the warehouses. The monopoly is bound by law to purchase the entire domestic production, but in each department where tobacco cultivation is permitted, the area authorised for planting is so fixed that the total domestic production will not exceed four-fifths of the quantity required by the factories. As a matter of fact this maximum ratio of domestic production, imposed because of the necessity of purchasing foreign tobacco for blending purposes, has not been attained for many years.

The monopoly maintains a service of field inspectors, assistant inspectors, and verifiers, to supervise the actual cultivation of the tobacco. The growers are grouped into sections of about 150 individuals, each section in charge of a verifier. A group of five to 10 sections is supervised by an inspector, aided by one or more assistant inspectors.

Tobacco seeds are delivered free of charge to the growers by the monopoly, which secures its supply by purchasing from certain growers some of their best plants. Sowing ordinarily takes place at the end of March, and between the middle of May and the end of June the plants are transplanted at the authorised number per acre. In July, the inspectors verify the number of plants per acre, and if the actual number exceeds the authorised number by more than one-fifth, the grower is heavily fined. If the actual number is more than one-fourth less than the authorised number and

the discrepancy is caused by no special climatic conditions, the permit to cultivate tobacco may not be renewed the following year.

Before the 15th of August the lower leaves are pulled from the stalks, and an inventory of the remaining leaves is taken by an inspector. All remaining leaves, with the exception of a certain allowance which might be expected to be lost in harvest and transit, must be delivered to the warehouse when the crop is harvested about the beginning of September.

The price which the French producers receive for their tobacco is fixed by a committee of 13 members, six chosen by the monopoly and six by the tobacco growers, with a chairman appointed by the Ministry of Finance. The established price is that for the average quality, premiums being paid for superior grades and penalties assessed for inferior ones. In order to determine the quality classification of tobacco as it is delivered, each warehouse has a local committee of experts composed of two officials of the monopoly and two growers. In case of disagreement a fifth member is named from a list of 50 of the most prominent growers of the department in the preceding year.

The production of tobacco in France ordinarily runs from 66,000,000 to 77,000,000 pounds; there are about 47,000 growers, and the area covered is about 42,000 acres.

Imported Tobacco.—Ordinarily the monopoly must import about 60,000,000 pounds of leaf tobacco a year from foreign countries, since its requirements are about 148,000,000 pounds, and the annual production in France and its Colonies amounts to only about 88,000,000 pounds. Efforts are being made to stimulate Colonial production, especially in Algeria and Madagascar. Most of the imported tobacco comes from the United States.

Tobacco Factories.—There are 22 tobacco factories which belong to the monopoly, and three private factories in Alsace and Lorraine which work for the monopoly. In addition the monopoly has at Limoges an establishment which manufactures most of the machinery used in the tobacco factories.

All the factories manufacture the ordinary smoking tobacco and cigarettes, while only a limited number of them turn out the higher grade smoking tobaccos and cigars. Only three or four of the largest factories make snuff, and chewing tobacco is manufactured only at the Morlaix plant.

The total number of workers employed in the tobacco factories is 15,000, of whom 3,000 are men and 12,000 women.

The United States furnishes most of the leaf imported into France, although the competition between Algerian tobaccos and Maryland types is growing stronger each year. Imports of leaf from the United States in 1928 amounted to 26,904,000 pounds, or 40 per cent. of the total leaf imports, as compared with 21,093,000 pounds, or 31 per cent. of the total, imported from Algeria.—*Western Tobacco Journal.*

A New Pest Threatens Australia.

Flies are hardly considered dangerous to animals, on account of their insignificant size; nevertheless, they are grisly opponents which are proving one of the greatest menaces to life, human and otherwise.

The latest reports from Australian cattle-raisers have given rise to considerable alarm with regard to the future of the great beef industry of the Commonwealth. A little-known fly, called the Buffalo Fly (*Lyperosia exigua*, from the Greek, meaning "troublesome"), is rapidly spreading through the chief cattle-rearing areas, and making it impossible to raise fat cattle for slaughter during certain seasons.

This pest attacks the flesh at the base of the horns, or any injured part of the skin, sucking the blood and causing intense irritation. The tormented cattle get no respite day or night, and loss of all rest reduces their condition until they become as ill-favoured as Pharaoh's lean kine.

It is thought that this winged enemy will prove the greatest factor in limiting the output of beef from the northern areas.

The Buffalo Fly came originally from Java, where the cattle appear less sensitive to its ravages, and until recently it was unknown in Australia, save in the northern coastal regions. To-day it is rapidly spreading south. It has entered Queensland from the east, and has already reached west; Wyndham is extremely badly infested, and recent reports state that it has even come so far south as Freemantle with the cattle boats.

This creature is related to the Tsetse Fly, the dreaded carrier of Sleeping Sickness, being similar in habits and appearance, and belonging to the blood-sucking family. The only practical possibility of controlling the Buffalo Fly that so far has presented itself is by the introduction of its parasites and predators, which, it is hoped, will make life as burdensome for the Buffalo Fly as this pest has for the cattle. To this end several scientists, in connection with the Council for Scientific and Industrial Research of Australia, are at work investigating its life and habits.—*Science Progress*, January, 1930.

Seeds for Sale, Gwebi Farm.

		s.	d.
Boer Manna	per lb.	0	4
Napier Fodder Roots	per bag	6	0
Edible Canna	per 100 "tubers"	9	0

All prices quoted are for *delivery free at any station or siding* in Southern Rhodesia. Before sending cheques, intending purchasers are advised to ascertain that the seeds, etc., required are still available. Cheques should be made payable to "Gwebi Farm." All orders and enquiries should be addressed to the Chief Agriculturist, Department of Agriculture, Salisbury, *not direct to the Gwebi Farm*.

A List of Plant Diseases Occurring in Southern Rhodesia.

Compiled by J. C. F. Hopkins, B.Sc. (Lond.), A.I.C.T.A.,
Plant Pathologist.

INTRODUCTION.

In accordance with recommendations made at the Imperial Agricultural Conference held in London in 1927 the following list of diseases has been compiled from records of the division of plant pathology. "A Preliminary List of Plant Diseases Recorded in Southern Rhodesia," which was published by Eyles in 1926, has been used as a foundation, to which a considerable number of additions have been made, whilst in many instances revision of specific and generic names has been required in order to bring the list up to date. Acknowledgments are due to the Director and staff of the Imperial Bureau of Mycology for assistance in the latter respect.

The list in no way represents a preliminary plant disease survey, so that localities from which diseases were reported have not been included, because such records are only misleading as a guide to distribution and are best retained elsewhere until much fuller information is available. It will be noticed that certain local names have been changed; for instance, the common peach Freckle has been listed as Scab. This change of nomenclature is in accordance with the system adopted by the British Mycological Society (published in their *Transactions*, Vol. XIV., Parts I. and II., March, 1929), and as far as possible this has been followed where diseases similar or identical with those occurring in Great Britain are recorded.

Objections may be raised to the listing of certain fungi as the cause of specific diseases—for example, *Botryodiplodia*

theobromæ or *Rhizoctonia bataticola* and root rot of citrus, where certain environmental conditions need to be fulfilled before penetration of the host is accomplished—but it is thought that in view of the present uncertainty as regards the definition of parasitism, it is better to include doubtful forms rather than to omit any which may be of importance in the light of future discoveries.

LIST OF PLANT DISEASES.

Acalypha sp.
- Mildew *Erysiphe polygoni* DC.

APPLE (*Pyrus malus* L.).
- Bitter Pit. Undetermined.
- Bitter Rot *Glomerella cingulata* (Stonem). S. & v.S.
- Black Rot *Physalospora cydoniæ* Arnaud.
- Canker *Diaporthe perniciosa* E. Marchal.
- Crown Gall *Bacterium tumefaciens* E. F. Sm. & Towns.
- Dieback *Bacterium* sp.
- Dieback *Valsa leucostoma* (Pers.) Sacc.
- Fly Speck *Leptothyrium pomi* (Mont. & Fr.) Sacc.
- Fruit Cracking *Coniothecium chomatosporum* Corda.
- Mildew *Podosphæra leucotricha* (Ell. & Ev.) Salm.
- Scab *Venturia inequalis* Aderh.
- Trunk Rot *Schizophyllum commune* Fr.

APRICOT (*Prunus armeniaca* L.).
- Crown Gall *Bacterium tumefaciens* E. F. Sm. & Towns.
- Rust *Puccinia pruni-spinosæ* Pers.
- Scab (Freckle) *Cladosporium carpophilum* Thüm.
- Shot Hole *Cercospora circumcissa* Sacc.
- Storage Rot *Rhizopus stolonifer* Ehrenb.

ARTICHOKE (*Helianthus tuberosus* L.).
- Leaf Spot *Cercospora* sp.

ARUM.
- Leaf Spot *Cercospora richardiæcola* Atk.

AVOCADO (*Persea americana* Mill.).
- Canker and Scab *Physalospora perseæ* Doidge.
- Leaf Disease *Stilbella* sp.

BALSAM (*Impatiens* sp.).
Mildew *Oidium* sp.

BAUHINIA (*Bauhinia* sp.).
Leaf Spot *Cercospora* sp.

BARBERTON DAISY (*Gerbera jamesonii* Hook).
Leaf Spot *Septoria gerberæ* Syd.
Root Rot *Sclerotium rolfsii* Sacc.
Wilt *Fusarium* sp.

BARLEY (*Hordeum* spp.).
Blindness, Local frost.
Covered Smut *Ustilago hordei* (Pers.) Kellern. and Swing.
Loose Smut *Ustilago nuda* (Jens.) Rostr.
Mildew *Erysiphe graminis* (Ell. and Ev.) Salm.
Rust *Puccinia anomala* Rostr.

BEANS.

FRENCH BEAN (*Phaseolus vulgaris* L.).
Anthracnose *Colletotrichum lindemuthianum* (Sacc. and Magn.) Br. and Cav.
Blight *Bacterium phaseoli* E. F. Sm.
Leaf Blotch *Cercospora cruenta* Sacc.
Root Rot *Sclerotium rolfsii* Sacc.
Rust *Uromyces appendiculatus* (Pers.) Le F.

VELVET BEAN (*Mucuna utilis*).
Leaf Spot *Phyllosticta phaseolina* Sacc.
Root Rot *Rhizoctonia* sp.
Rust *Uromyces mucunæ* Rabenh.
Seedling Spot *Pseudopeziza* sp.

DOLICHOS BEAN (*Dolichos lablab* L.).
Seedling Blight *Rhizoctonia* sp.
Blight *Bacterium phaseoli* E. F. Sm.

KAFFIR BEAN (See COWPEA).

BEET (*Beta vulgaris* L.).
Leaf Spot *Cercospora beticola* Sacc.

BEGGAR WEED (*Desmodium tortuosum*).
Anthracnose *Colletotrichum omnivorum* Halst.

Berlinia spp.
Leaf Spot *Phyllachora brachystegiæ* Doidge.

Borreria sp.
Rust *Puccinia borreriæ* Syd.

Brachystegia spp.
Leaf Spot *Macrosporium* sp.
Leaf Spot *Phyllachora brachystegiæ* Doidge.
Trunk Rot *Xylaria allantoidea* Berk.

CABBAGE (*Brassica oleracea* L.).
Foot Rot *Phoma brassicæ* Thüm.
Leaf Spot *Alternaria circinans* (Berk. and Curt.) Bolle.

Callitris sp.
Leaf Spot *Pestalozzia funerea* Desm.

CAMPHOR LAUREL (*Pittosporium undulatum*).
Root Disease *Rhizoctonia bataticola* (Taub.) Butl. (Group A of Haig.*)
Root Disease *Botryodiplodia theobromæ* Pat.

Canthium lanciflorum.
Rust *Hemileia woodii* Kalchbr. and Cke.

CAPE GOOSEBERRY (*Physalis peruviana* L.).
Leaf Spot *Alternaria* [? *solani* (Ell. and Mart.) Jones & Grout].
Leaf Spot *Phyllosticta* sp.
Mosaic Virus.
Smut *Entyloma physalidis* (Kalchbr. & Cke.) Wint.

CARNATION (*Dianthus carypohyllus* L.).
Leaf Spot *Septoria dianthi* Desm.
Rust *Uromyces dianthi* (Pers.) Niessl.
Wilt *Fusarium* sp.

CARROT (*Daucus carota* L.).
Root Rot *Sclerotium rolfsii* Sacc.

CASTOR (*Ricinus communis* L.).
Rust *Melampsora ricini* Passer.

CELERY (*Apium graveolens* L.).
Leaf Spot *Septoria apii* Chester.

CHILLI (*Capsicum* spp.).
Leaf Spot *Cercospora* sp.

* Haigh, J. C. *Macrophomina phaseoli* (Maubl.) Ashby and *Rhizoctonia bataticola* (Taub.) Butl., Ann. Roy. Bot Gard. Peradeniya, vol. xi, part 3. Ceylon, 1930.

CHRYSANTHEMUM (*Chrysanthemum* spp.).
Blotch *Septoria chrysanthemella* (Cav.) Sacc.
Mildew *Oidium chrysanthemi* Rabenh.

Cissus sp.
Leaf Spot *Cercospora* [? *viticola* (Ces.) Sacc.].
Rust *Aecidium vitis* A. L. Smith.

CITRUS.

GRAPE FRUIT (*Citrus grandis* Osbeck).
Fruit Spot *Leptothyrium pomi* (Mont. & Fr.) Sacc.
Defoliation; fumigation damage.
Leaf Disease *Pseudomeliola* sp.
Root Disease *Rhizoctonia bataticola* (Taub.) Butl. (Group A of Haig.).
Sooty Mould *Capnodium citri* Berk. & Desm.

LEMON (*Citrus limonia* Osbeck).
Anthracnose *Colletotrichum gloesporioides* (Penz.) Sacc.
Fruit Pustules; mechanical damage.
Leaf Spot *Alternaria* [? *citri* Pierce].
Leaf Spot *Coniothecium citri* McAlp.
Scab *Sporotrichum citri* Butl.
Sooty Mould *Capnodium citri* Berk. & Desm.
Root Disease *Macrophomina phaseoli* (Maubl.) Ashby. [= *Rhizoctonia bataticola* (Taub.) Butl. Group C of Haig.]
Trunk Rot *Trametes meyenii* (Kl.) Cke. [= *Polystictus obstinatus* Cooke.]

NAARTJE (*Citrus nobilis* Lour.).
Anthracnose *Colletotrichum gloeosporioides* (Penz.) Sacc.
Fruit Rot *Alternaria citri* Pierce.
Scaly Bark (*Psorosis*) Undetermined.

ORANGE (*Citrus sinensis* Osbeck).
Anthracnose *Colletotrichum gloeosporioides* (Penz.) Sacc.
Bark Disease *Ascochyta citricola* McAlp.
Bark Disease; fumigation injury and *Fusarium* sp.
Blossom End-Split; incorrect water relations.
Blue Contact Mould *Penicillium italicum* Wehm.
Collar Rot *Botryodiplodia theobromæ* Pat.

Collar Rot *Fusarium* sp.
Concentric Ring Blotch; undetermined (probably a deficiency disease).
Dieback *Alternaria* sp.
Chlorosis; waterlogging.
Fruit "Pit Markings"; undetermined.
Fruit Rot *Alternaria* (? *citri* Pierce).
Fruit Rot *Botrytis cinerea* Pers.
Fruit Rot *Diplodia natalensis* Pole Evans.
Fruit Spot *Leptothyrium pomi* (Mont. & Fr.) Sacc.
Fruit Spot *Phoma* sp.
Green Mould *Penicillium digitatum* Sacc.
Internal Gummosis (*Endoxerosis*); undetermined.
Leaf Spot *Coniothecium citri* McAlp.
Leaf Spot *Epicoccum granulatum* Lenz.
Leaf Spot *Phyllosticta* sp.
Root Disease *Rhizoctonia bataticola* (Taub.) Butl. (Group A of Haigh).
Root Disease *Macrophomina phaseoli* (Maubl.) Ashby. [= *Rhizoctonia bataticola* (Taub.) Butl. Group C of Haigh.]
Scab *Sporotrichum citri* Butl.
Scaly Bark (*Psorosis*); undetermined.
Scurf, White *Coniothecium scabrum* McAlp. (? cause).
Sour Rot *Oospora citri-aurantii* (Ferraris).
Sooty Mould *Capnodium citri* Berk. & Desm.
Storage Rot *Cephalothecium roseum* Ferraris.
Tear Stain; undetermined (probably insect or mechanical damage).
Twig Blight *Diplodia natalensis* Pole Evans.
Twig Disease *Cladosporium herbarum* (Link.) Fr.

COFFEE (*Coffea* spp.).
Algal Spot *Cephaleuros* sp.
Leaf Spot *Cercospora coffeicola* Berk. & Curt.
Rust (Leaf Disease) *Hemileia vastitrix* Berk. & Br.

Commelina sp.
Rust *Uromyces commelinæ* Cke.

(*To be continued.*)

Correspondence.

[No responsibility is accepted by this Journal for the views expressed by correspondents.]

The Editor,
The Rhodesia Agricultural Journal.

Dear Sir,

Rock Phosphate.

The article written by the Chief Chemist, Mr. A. D. Husband, on "The Value of Rock Phosphate and Bone and Superphosphate as Fertiliser for Maize Production," and published in your December Journal, is welcomed by maize growers, proving as it does that the type of rock phosphate used in the experiments described may take a place of honour beside the well-tried and popular "bone and super" mixture. The records carry with them an air of accuracy. It is not stated, but is common knowledge, that the rock phosphate used was that known as "Christmas Island."

The experiment showed a total increase of maize in three years of about ten bags per acre for bone and super, and twelve and a half bags for the Christmas Island rock phosphate. Had the latter been applied by the optimum method for "insoluble" fertilizers—"broadcasting, harrowing and ploughing under"—I have no doubt that the result in its favour would have been more immediate as well as greater. That will doubtless be proved during the next few years, when the "Method of Application" experiments now being laid down have had time to show results.

In the meantime it might be as well to record that the 150 lbs. of bone and super added 28 lbs. of phosphoric oxide per acre to the plots, and 150 lbs. of Christmas Island rock phosphate added 58 lbs. The additional crop of ten bags of maize and extra weight of stalks harvested in three years removed from the bone and super plots about 22 lbs. of phosphoric oxide, leaving 6 lbs. in the soil, while the extra 12½ bags of maize with stalks harvested in three years from the "rock" plots removed about 27 lbs. of phosphoric oxide,

leaving 31 lbs. still in the soil at the end of three years. That must surely count in favour of the particular class of rock phosphate used in the experiment—*a type which is not at present available for sale in Southern Rhodesia.*

Permit me, sir, to place before your readers at the earliest possible moment the following points concerning rock phosphates, which our railway rates allow to compete on the Rhodesian market.

Rock phosphates vary a great deal, not only in their content of phosphoric acid, but in the quality or condition of the material—a matter of great significance.

The following are, broadly, the types:—

(i.) *Apatite.*—A crystalline or glassy hard "rock" usually of a high degree of purity, but not usually responsive in the soil unless in extremely fine condition.

(ii.) *"American" Rock Phosphates.*—Mostly Florida, Tennessee or Carolina; generally nodular concretions; a little more responsive in the soil, but not much better than Apatite.

(iii.) *North African.*—Largely fossil residues, cemented together by secondary phosphates, or lime with various impurities. These are said to be "softer" by the manufacturer's chemists, but are not necessarily more responsive in the soil on that account.

(iv.) *Pacific Island Rock Phosphates.*—Such as Nauru, Christmas Island or Ocean Island phosphates, formed by the action of guano on coral and containing very little iron, alumina or silica. These are all of geologically recent formation, and although sometimes hard to handle, are definitely and actively responsive to suitable treatment in the soil. This is the type used in the experiments. It is almost exclusively from British territory and is handled by British subjects.

Yours faithfully,

THOS. J. MOSSOP.

"Protea," Glendale,
23rd February, 1930.

The Editor,

The Rhodesia Agricultural Journal.

Dear Sir,

Farm Economy.

I have read with interest in your March issue the "Costings at the Gwebi Farm," and also happily inserted in the same issue a paper read by Arthur A. Ruston on "Some Aspects of Cost of Production Studies in Agriculture."

Ten years of farming in Rhodesia have brought home to me the importance of general farm economy, and though many of us keep books, few of us make them "talk" after they are closed.

It would be of the greatest assistance to the farming community of this country if we could have some concrete standard on which to work.

For instance, Mr. Ruston says that on a normal farm labour absorbs 28 per cent. in money of the total output, and on the more successful farms 20 per cent. of the output. Should these figures apply to Rhodesia? Are they too high or too low?

Let there be a campaign of economy preached by your divisional experts and advisers. Let all advice given to farmers by your department begin in terms of £ s. d. and end in the same vein. How many of us have come croppers by sticking to text books and advice by experts on the feeding of stock?

The feeding of dairy cattle with butter fat at 1/- per lb. is a problem which needs the closest attention, bearing in mind that our natural pasture is little or no help during nine months of the year. The man who can keep a pedigree cow at her maximum milk flow from April to December and sell cream to the creameries and show a reasonable profit is a wizard.

At this time of crisis no Government help, subsidies, pools or protection are going to help us. Every man must resolutely set about putting his own house in order, cut his overhead charges to a minimum and go all out for yield per acre.

Excepting the tobacco debacle, our agricultural depression is due largely not so much to lack of markets but to our unprofitable yields per acre. Our Chief Agriculturist

has preached green cropping in season and out of season as the only way of renovating our worn-out soils, and his advice is proving sound all over the Colony. Pinch and scrape and economise in every direction but go for the yield per acre.

Yours, etc.,

"X."

[We are pleased to publish this interesting letter. The work at Gwebi is merely the beginning of what we hope will be a system of costings applied both to this farm and to the commercial section of the Sand Veld farm at Marandellas. Already the Gwebi costings are giving indications of directions in which economy must be studied, and when the costings of this farm and those on the Sand Veld Demonstration farm can be compared, even more interesting deductions should be possible.—Ed., *R.A.J.*]

Review.

"PRUNING IN SOUTH AFRICA."

By Professor H. Clarke Powell: Price, 3s.

The Central News Agency of Johannesburg has published a book of importance to fruit growers bearing the above title. The author has consolidated a wealth of information into fifty pages, covering fruit tree pruning from the time of planting to the mature tree. Chapters are also devoted to the general aspects of pruning, the pruning of individual fruits, pruning tools, fruit thinning and the purchase of nursery trees.

Professor Powell has produced a book which meets a long-felt want, for pruning is a necessary orchard operation that is little understood by the average fruit grower. With the advent of this work a natural improvement should become manifest in those orchards where the author's advice is carried into practice.

We can thoroughly recommend this book to anyone interested in fruit growing, be he student, a grower of fruit on a commercial scale or the owner of a small home orchard.

G. W. M.

Southern Rhodesia Weather Bureau.

FEBRUARY, 1930.

Pressure.—The mean pressure during the month was very high, varying from 0.047 in. above normal at Bulawayo to 0.040 in. above normal at Fort Victoria. The country was affected by four high pressure systems and by four low pressure systems. The first high appeared in the west on the 1st and moved round the coast on the 3rd and 4th, and remained on the east coast until the 8th. The second was on the west coast on the 6th and 7th and moved round on the 9th and 10th, and was on the east coast until the 15th. The third moved round the coast on the 14th to 16th and was off the east coast until the 18th. A further high appeared on the south-east coast on the 17th, where it remained until the 20th; it then moved inland and extended over Southern Rhodesia on the 21st to 23rd; it remained in evidence until the 28th. The first low was off the south-east coast on the 1st and 2nd. The second low appeared off the north-west coast on the 4th and moved round the coast, being off Lourenco Marques on the 8th. The third low originated in West Africa on the 7th; the trough passed through the Union on the 11th to 13th, and it disappeared off the east coast on the 14th. A low was active in West Africa from the 15th to the 22nd. The fourth low passed round the coast between the 24th and 26th with little effect.

Temperature.—The mean temperature for the month was about normal. The mean maximum temperatures were uniformly high. The mean minimum temperatures were slightly below normal. Relative humidity was generally much below normal.

Rain Periods.—The rain during the month consisted largely of light showers, except in the Midlands, where heavy

downpours occurred. From the 1st to 4th light showers were recorded; from the 5th to 9th no showers were recorded; on the 10th and 11th light showers fell in the south-east; from the 12th to 17th isolated showers fell; from the 18th to 22nd light showers were numerous and heavy downpours occurred in the Midlands; from the 23rd to 28th light scattered showers fell.

Rain.—The total rainfall for the month was 2.24 ins., or about 40 per cent. of the normal. The following table shows the position to the end of February in each zone:—

Zone.	Seasonal to 1st March.	Per cent. of Average.
A	19.3	93
B	12.5	71
C	20.3	80
D	22.0	80
E	19.2	75
F	24.0	62

RAINFALL.

Station.	1930. Jan.	Feb.	Total to end of period.	Normal rainfall to end of period.
Zone A.:				
Bubi—				
Bembesi Railway	4.02	3.40	17.57	19.68
Glenarton	4.69	2.84	13.84	18.76
Inyati	2.69	1.00	18.50	20.10
Judsonia	2.75	2.02	13 39	n.s.
Martha Farm	2.68	1.64	13.22	15.08
Nduba Farm	2.86	1.76	14.56	n.s.
Shangani Estate	3.83	4.10	18.29	20.25
Bulalima-Mangwe—				
Centenary	7.01	1.97	18.79	17.05
Kalaka	3.86	4.41	20.37	17.22
Riverbank	4.45	3.50	16.39	19.83
Solusi Mission	3.91	3.64	16.19	19.50
Bulawayo—				
Fairview Farm	9.01	0.54	20.84	17.75
Keendale	5.79	1.27	19.70	17.45
Lower Rangemore	6.40	...	...	18.84
Observatory	5.69	0.70	15.08	19.29
Waterworks	5.13	1.45	14.40	18.49
Gwelo—				
Brockenhurst	1.35	2.51	15.23	n.s.
Frogmore	1.93	1.20	18.40	n.s.
Gwelo Gaol	1.39	1.66	16.35	21.72
Riversdale Estate	...	...	...	22.22
Somerset Estate	1.51	...	...	20.90
Insiza—				
Orangedale	3.07	4.93	16.54	21.57
Shangani	2.79	1.59	14.73	20.11
Thornville	1.84	1.10	11.42	19.38
Nyamandhlovu—				
Gwaai Reserve	5.58	1.44	17.94	16.36
Gwaai Siding	4.10	2.75	17.77	n.s.
Naseby	4.55	3.03	14.20	18.04
Nyamandhlovu Railway	3.67	1.03	12.17	18.72
Sebungwe—				
Gokwe	6.61	5.48	23.22	24.98
Umzingwane—				
Springs	6.72	1.16	15.02	19.41
Wankie—				
Dett	8.72	5.53	27.18	16.93
Matetsi Railway	3.72	2.38	15.25	23.44
Ngamo Railway	5.68	3.81	18.57	20.68
Rosslyn	8.09	3.56	20.09	n.s.
Sukumi	6.12	3.66	19.85	20.82
Tom's Farm	5.22	1.93	15 68	n.s.
Victoria Falls	11.30	4.10	24.50	n.s.
Victoria Falls Railway	10.89	3.96	24.28	23.90
Wankie Hospital	6.18	2.45	15.51	19.60

RAINFALL—*(Continued)*.

STATION.	1930. Jan.	Feb.	Total to end of period.	Normal rainfall to end of period.
ZONE B.:				
Belingwe—				
Bickwell ...	2.92	2.05	17.13	17.39
Sovelele ...	...	...	...	15.83
Tamba ...	4.26	2.33	13.08	15.09
Wedza ..	...	..	...	18.40
Bulalima-Mangwe—				
Bruwapeg ...	...	...	...	16.01
Empandeni ...	4.06	3.02	13.48	18.04
Fallowfields ...	4.76	1.89	13.12	n.s.
Garth ...	4.05	1.54	12.02	21.33
Maholi ...	...	...	...	22.93
Retreat ...	4.25	2.67	15.38	17.66
Sandown ...	3.34	1.20	12.89	19.88
Semokwe Reserve ...	6.31	0.54	13.88	n.s.
Tjankwa ...	4 31	1.41	12.20	22.08
Tjompani ...	4.53	...	...	19.34
Chibi—				
Bubye ...	1.10	1.55	7.77	10.90
Mtendelende ...	...	...	...	6.21
Nuanetsi Homestead ...	2.24	4.01	13.90	12.83
Nuanetsi N.C. ...	1.82	2.88	15.06	...
Gwanda—				
Gwanda Gaol ...	4.77	1.30	11.82	17.07
Limpopo ...	1.75	0.39	6.53	9.97
Mazunga ...	2.40	...	...	13.66
Mtetengwe ...	1.56	0.80	7.78	9.65
Tuli ...	2.84	1.71	14.22	11.77
Insiza—				
Albany ...	2.55	2.38	14.79	19.63
Filabusi ...	6.83	1.19	16.02	18.25
Fort Rixon ...	3.12	4.12	17.35	18.61
Inyezi ...	4.37	3.02	16.95	18.19
Lancaster ...	6.19	2.52	14.89	18.76
Scaleby ...	4.18	3.21	15.58	n.s.
Wanezi Mission ...	4.03	2.01	16.77	n.s.
Matobo—				
Bon Accord ...	2.45	2.36	11.08	n.s.
Fort Usher ...	5.89	1.63	14.39	n.s.
Holly's Hope ...	2.96	1.43	12.22	16.83
Longsdale ...	4.44	0.91	16.44	n.s.
Matopo Mission ...	6.40	1.84	16.73	21.18
Mtshabezi Mission ...	3.84	1.89	12.17	17.85
Rhodes Matopo Park ...	5.10	1.80	15.10	19.69
Umzingwane—				
Balla Balla ...	6.43	1.37	15.69	19.56
Essexvale ...	8.08	1.26	19.52	19.94
Hope Fountain ...	5.27	2.24	18.58	22.05

RAINFALL—(*Continued*).

Station.	1930. Jan.	1930. Feb.	Total to end of period.	Normal rainfall to end of period.
ZONE C.:				
Charter—				
Bushy Park ...	4.10	3.51	17.29	23.95
Enkeldoorn ...	5.32	1.64	19.79	24.42
Marshbrook ...	7.60	1.70	26.67	24.37
The Range ...	4.54	1.07	21.20	25.55
Vrede ...	6.41	4.43	23.98	24.93
Chilimanzi—				
Beacon Hill ...	3.08	2.64	17.19	23.48
Central Estates ...	3.64	1.95	17.46	25.85
Fourie's Post ...	1.95	2.10	11.90	21.35
Orton's Drift ...	3.25	2.17	18.66	20.74
Sebakwe Post ...	4.08	2.38	17.92	20.12
Umvuma Railway ...	4.22	2.35	16.83	23.11
Gwelo—				
Cross Roads ...	3.58	1.63	13.93	23.31
Delano Estate ...	3.36	1.97	15.34	n.s.
East Clare Ranch ...	4.62	...	...	25.87
Forestvale ...	2.73	3.80	18.58	n.s.
Globe and Phœnix Mine ...	3.73	3.39	19.37	23.71
Lannes Farm ...	3.32	2.26	16.38	n.s.
Lalapanzi ...	2.61	4.47	17.73	26.76
Lyndene ...	2.37	1.38	18.54	21.57
Woodendhove ...	2.09	3.59	16.48	24.63
Wold Farm ...	2.79	4.00	17.21	n.s.
Hartley—				
Ardgowan ...	...	...	...	25.86
Balwearie ...	5.13	8.44	23.27	25.93
Battlefields ...	9.94	6.45	26.45	24.17
Beatrice ...	3.48	2.39	17.19	26.13
Carnock ...	7.51	2.08	26.06	25.39
Cromdale ...	7.14	2.80	23.59	24.85
Currandooley ...	5.97	5.45	22.98	n.s.
Eiffel Blue Mine ...	4.64	9.07	24.30	21.58
Elvington ...	6.70	2.13	24.68	25.58
Gatooma ...	6.07	7.52	23.00	26.85
Cotton Breeding Station ...	4.83	7.84	23.32	n.s.
Gowerlands ...	5.65	1.75	22.43	25.36
Handley Cross ...	5.19	7.39	20.37	n.s.
Hartley Gaol ...	4.69	4.20	22.51	27.14
Hopewell ...	3.78	2.59	23.45	25.43
Jenkinstown ...	6.11	3.84	23.98	24.69
Maida Vale ...	3.31	7.46	20.06	23.13
Meadowlands ...	9.31	2.51	25.90	n.s.
Nyadgori ...	5.96	2.02	22.76	23.10
Pulham ...	6.88	2.21	24.16	27.16
Ranwick ...	5.01	4.98	26.49	27.39
Sunny Bank ...	5.37	4.97	21.38	n.s.
Thorndyke ...	3.92	2.59	19.51	22.52

RAINFALL—(*Continued*).

Station.	1930. Jan.	Feb.	Total to end of period.	Normal rainfall to end of period.
ZONE C.—(Continued)				
Lomagundi—				
Argyle ...	7.43	2.46	22.10	26.63
Baguta ...	10.56	1.08	21.95	27.28
Between Rivers ...	7.76	1.10	20.53	n.s.
Citrus Estate ...	10.48	1.36	21.82	24.93
Strathdon ...	7.69	2.03	21.26	n.s.
Darwendale ...	3.10	2.15	17.29	24.99
Dedsi ...	8.25	1.65	20.80	25.90
Dingley Dell ...	9.36	2.51	20.05	22.36
Gambuli ...	7.13	2.45	17.69	28.37
Kapiri ...	6.09	1.52	19.65	25.72
Kashao ...	7.22	2.56	20.42	n.s.
Kenidia ...	5.07	1.10	15.77	n.s.
Mafoota ...	5.82	0.78	20.45	24.58
Maningwa ...	9.31	4.15	24.14	26.19
Miami ...	5.13	1.82	19.60	n.s.
Mica Field ...	5.26	1.64	13.24	23.13
Montrose ...	8.07	3.37	24.59	24.92
Mpandegutu ...	9.92	1.34	23.75	25.42
Msina ...	8.90	2.28	20.85	n.s.
Mukwe River Ranch ...	6.81	2.16	20.93	24.50
Nyapi ...	8.28	1.04	18.38	24.90
Wari ...	7.41	2.87	19.90	24.08
Nyati ...	9.17	2.01	21.13	20.72
Palm Tree Farm ...	9.34	2.46	24.35	24.87
Pendennis ...	3.41	3.02	17.12	n.s.
Raffingora ...	...	...	...	23.54
Renardia ...	6.26	2.06	22.05	25.22
Richmond ...	4.67	0.89	18.11	21.60
Robbsdale ...	5.49	2.60	19.53	n.s.
Romsey ...	...	...	...	24.45
Silater Estate ...	6.13	1.84	17.85	...
Sinoia ...	9.27	1.72	20.57	26.03
Sipolilo ...	7.59	1.09	20.69	27.22
Umvukwe Ranch ...	6.94	0.98	20.92	27.83
Woodleigh ...	11.59	2.67	24.86	26.75
Yeanling ...	7.26	2.25	20.73	25.18
Zebra Vlei ...	5.66	2.49	19.05	24.13
Marandellas—				
Rocky Spruit ...	5.70	4.16	32.06	32.68
Mazoe—				
Pembi Ranch ..	6.25	3.40	23.17	n.s.
Salisbury—				
Avondale (Broadlands) ...	7.73	1.57	20.14	26.84
Ballineety ...	4.06	0.69	16.56	24.50
Botanical Experiment Station	5.10	1.88	20.21	22.36
Bromley ...	7.77	1.86	27.72	26.39
Cleveland Dam ...	5.96	2.92	23.42	25.54
Forest Nursery ...	3.49	2.00	19.01	25.90
Gwebi ...	5.93	1.43	18.59	26.23

RAINFALL—(*Continued*).

Station.	1930. Jan.	1930. Feb.	Total to end of period.	Normal rainfall to end of period.
ZONE C.—(Continued)				
Salisbury (continued)—				
Salisbury Agricultural Dept.	3.90	1.43	17.82	23.32
Sebastopol ...	5.54	1.63	21.01	26.31
Stapleford ...	4.20	2.80	17.76	27.80
Tobacco Experiment Station	3.21	1.55	18.25	26.45
Western Commonage ...	7.62	1.56	21.26	21.97
Sebungwe—				
Sikombela ...	5.05	3.33	20.84	25.42
Wolverley ...	5.10	2.72	17.13	20.37
ZONE D. :				
Darwin—				
Cullinan's Ranch ..	5.30	2.60	21.94	23.18
Mount Darwin ...	6.40	1.18	17.43	25.86
Rusambo ...	8.08	0.94	19.96	n.s.
Inyanga—				
Inyanga ...	5.33	0.95	19.92	30.13
Juliasdale ...	5.67	1.55	29.12	33.05
Rhodes Estate ...	4.18	2.98	23.30	33.72
Makoni—				
Ardlamont ...	7.20	1.37	25.11	n.s.
Eagle's Nest ...	7.71	1.18	25.17	26.26
Mayo Ranch ...	3.74	1.40	19.11	n.s.
Wensleydale ...	9.22	2.73	28.63	25.28
Mazoe—				
Argyle Park ...	7.16	2.70	20.77	25.89
Atherstone ...	9.15	1.52	25 53	26.47
Bellevue ...	5.85	2.75	20.30	25.80
Bindura ...	6.19	1.56	17.91	26.15
Ceres ...	7.55	0.81	23.43	29.78
Chipoli ...	6.64	0.84	26.49	26.58
Citrus Estate ...	4.87	1.80	21.72	27.74
Craigengower ...	6.86	1.96	22.35	27.07
Dandejena ...	5.20	1.49	22.08	n.s.
Donje ...	5.29	3.16	23.41	n.s.
Frogmore ...	8.11	2.90	25.29	26.40
Glen Divis ...	8.36	1.22	22.73	29.64
Glen Grey ...	5.49	1.42	17.76	23.90
Great B ...	8.99	5.00	25.30	27.08
Hinten ...	3.00	...	...	20.34
Horta ...	5.93	...	...	n.s.
Kilmer ...	6.77	1.80	22.54	27.09
Kingston ...	8.87	0.92	24.87	29.93
Maienza ...	7.37	0.76	26.30	27.90
Marston Farm ...	6.51	1.42	19.72	n.s.
Mazoe Dam ...	5.44	1.23	21.15	27.48
Mgutu ...	5.62	3.15	19.79	29.08
Muripfumba ...	7.34	3.06	27.12	24.18
Omeath ...	7.26	1.39	24.56	26.48

RAINFALL—*(Continued).*

STATION.	1930. Jan.	Feb.	Total to end of period.	Normal rainfall to end of period.
ZONE D.—(Continued)				
Mazoe (continued)—				
Pearson Settlement ...	5.37	1.75	16.45	26.08
Riversdale Estate ...	6.27	1.02	17.20	24.23
Ruia ...	5.92	1.67	24.09	28.86
Rustington ...	8.20	0.20	26.62	24.42
Shamva Mine ...	6.16	0.97	24.49	27.19
Stanley Kop ...	7.36	1.77	22.93	25.11
Sunnyside ...	6.82	0.77	22.42	27.45
Teign ...	5.21	1.31	18.15	27.38
Usk ...	10.21	0.82	27.49	31.25
Virginia ...	9.25	0.35	21.01	26.01
Visa ...	7.86	1.87	24.25	n.s.
Woodlands ...	...	...	...	28.59
Zombi Farm ...	6.95	0.99	24.30	29.97
Mrewa—				
Maryland ...	4.00	1.31	21.12	n.s.
Montclair ...	6.53	0.82	21.60	n.s.
Mrewa ...	3.51	2.25	20.14	28.61
Nyaderi Mission ...	3.46	0.66	19.35	23.75
Selous Nek ...	4.05	0.75	21.95	28.16
Mtoko—				
Makaha ...	5.26	0.19	17.57	28.37
Mtoko (N.C.) ...	5.64	2.54	30.19	24.18
Salisbury—				
Arcturus ...	5.89	1.47	21.75	29.55
Chindamora Reserve ...	5.81	...	...	27.04
Glenara ...	6.97	2.77	18.71	26.75
Goromonzi ...	6.59	2.10	21.86	28.94
Hatcliffe ...	4.38	1.34	16.95	27.75
Hillside (Bromley) ...	6.67	1.21	26.24	28.05
Kilmuir ...	6.71	1.62	18.77	31.24
Meadows ...	6.75	1.91	24.93	31.28
Pendennis ...	3.69	1.40	18.00	n.s.
Selby ...	5.57	3.45	21.11	25.19
Springs ...	8.21	1.34	20.52	25.83
Teviotdale ...	4.78	1.91	17.70	n.s.
Vainona ..	3.87	1.75	16.92	26.18
ZONE E.:				
Belingwe—				
Belingwe (N.C.) ...	3.66	0.98	16.45	18.60
Doro ...	6.01	1.39	19.12	17.84
Shabani ...	3.70	0.77	11.23	18.66
Bikita—				
Angus Ranch ...	4.50	1.24	17.02	16.45
Bikita ...	7.04	4.28	26.76	25.60
Devuli Ranch ...	3.04	0.61	13.06	16.50
Pamushana ...	...	...	...	28.24

RAINFALL—(*Continued*).

Station.	1930. Jan.	1930. Feb.	Total to end of period.	Normal rainfall to end of period.
ZONE E.—(Continued)				
Charter—				
Buhera ...	3.70	1.20	15.71	26.75
Chibi—				
Chibi ...	1.88	0.87	17.25	19.10
Lundi ...	12.04	1.20	26.56	19.26
Mpapas ...	6.51	...	...	16.13
Chilimanzi—				
Allanberry ...	4.06	1.33	19.24	22.84
Driefontein ...	2.80	2.31	12.48	22.08
Felixburg ...	2.28	1.86	14.24	22.50
Grootfontein ...	2.90	...	...	21.80
Induna Farm ...	3.66	1.56	11.81	25.50
Mtao Forest ...	6.38	1.85	16.42	23.55
Mukowries ...	6.41	2.92	16.97	n.s.
Thornhill ...	3.03	1.19	12.59	n.s.
Gutu—				
Alheit Mission ...	3.53	0.40	15.25	19.32
Devuli Store ...	...	...	...	n.s.
Eastdale Estates ...	3.97	1.15	20.22	25.13
Gutu (N.C.) ...	2.92	1.11	14.41	23.70
Glenary ...	3.64	0.68	15.54	20.06
Gwelo—				
Glencraig ...	4.07	2.67	19.71	25.65
Partridge Farm ...	3.30	4.69	20.40	25.75
Sheep Run Farm ...	2.47	1.94	14.08	21.85
Inyanga—				
St. Trias' Hill ...	5.30	1.95	28.95	30.38
Insiza—				
Roodeheuvel ...	4.71	2.80	18.28	21.40
Stoneham (Brae Valley) ...	5.18	3.47	17.26	n.s.
Makoni—				
Bude ...	...	...	...	n.s.
Craigendoran ...	4.22	0.09	20.35	26.09
Forest Hill ...	6.54	1.20	24.06	28.05
Kairidzi ...	5.43	0.87	24.90	n.s.
Mona ...	6.11	2.02	27.85	29.31
Monte Cassino ...	10.38	1.14	28.98	27.69
Ruati ...	4.51	0.73	20.97	n.s.
Rusape (N.C.) ...	4.37	0.78	26.33	n.s.
Springs ...	4.59	1.35	27.59	27.08
Whitgift ...	3.49	0.26	19.90	n.s.
Marandellas—				
Bonongwe ...	6.26	4.55	29.94	26.00
Delta ...	7.01	2.89	30.13	29.49
Elandslaagte ...	5.58	3.96	26.84	24.49
Lushington ...	6.17	...	...	n.s.
Macheke ...	7.82	1.08	24.48	27.43
Marandellas (N.C.) ...	7.27	3.28	30.73	...

RAINFALL—(*Continued*).

STATION.	1930. Jan.	1930. Feb.	Total to end of period.	Normal rainfall to end of period.
ZONE E.—(Continued)				
Marandellas (Continued)—				
Marandellas Estate ...	5.45	4.50	31.57	...
Nelson ...	4 36	2.24	27.01	...
Wedza Reserve ...	7.27	3.10	27.85	...
Wenimbi ...	8.34	...	...	...
Melsetter—				
Brackenbury ...	6.89	...	...	41.94
New Year's Gift ...	5.13	...	...	n.s.
Sabi Tanganda Estate ...	3.50	0.20	12.20	n.s.
Ndanga—				
Bangala Ranch ...	6.35	...	...	n.s.
Doornfontein ...	3 38	0.93	19.58	21.25
Marah Ranch ...	3.15	0.65	16.87	24.71
Triangle Ranch ...	7.93	1.11	16.55	16.12
Zaka ...	4.34	1.69	17.98	n.s.
Selukwe—				
Aberfoyle Ranch ...	4.86	1.35	18.38	22.10
Hillingdon ...	4.84	2 27	18.64	26.17
Impali Source ...	3.75	2.26	16.67	21.70
Rio ...	2.97	3.05	18.63	24.41
Safago ...	3.27	2.93	20.74	26.43
Selukwe ...	5.88	5.53	30.91	30.52
Umtali—				
Argyll ...	3.09	0.30	16.16	27.03
Embeza ...	4.95	7.19	35.31	n.s.
Fairview ...	2.13	0.85	17.68	27.24
Fern Valley ...	3.09	0.65	17.56	28.01
Jerain ...	4.18	0.52	18.41	24 36
Mountain Home ...	7.08	5.53	32.67	n.s.
Mutambara Mission ...	3.12	0.97	15.99	23.01
Odzani Power Station ...	6.21	0.97	22.68	28.98
Park Farm ...	3.03	3.54	20.81	32.04
Premier Estate ...	4.86	0.80	21.98	24.86
Sarum ...	4.42	...	...	24.67
Sheba ...	10.08	7.40	46.62	n.s.
Stapleford ...	8.30	6.47	37.85	51.86
St. Augustine's Mission ...	4.17	1.92	24.06	30.63
Transsau Estate ...	2.33	...	...	24.26
Umtali Gaol ...	2.78	1.71	20.76	24.29
Victoria—				
Brucehame ...	2.01	2.38	16.62	21.70
Cambria ...	1.62	1.61	13.59	17.19
Cheveden ...	3.74	1.55	20.33	25.98
Clipsham ...	1.92	3.91	18.80	21.87
Gokomere ...	2.97	...	...	...
Kimberley Ranch ...	3.15	1.28	18.33	n.s.
Mashaba ...	4.63	1.15	17.99	21.98
Miltonia ...	2.18	2.70	14.99	n.s.
Riverdene North ...	2.00	1.74	15.78	20.31

RAINFALL—*(Continued)*.

STATION.	1930. Jan.	1930. Feb.	Total to end of period.	Normal rainfall to end of period.
ZONE E.—(Continued)				
Victoria (Continued)—				
Salemore ...	2.57	1.34	21.61	24.31
Silver Oaks ...	2.64	1.61	16.85	22.67
Stanmore ...	2.08	1.24	13.89	18.82
Victoria ...	2.18	2.49	16.26	20.74
Zimbabwe ...	3.08	1.61	18.29	22.73
ZONE F.:				
Melsetter—				
Chikore ...	4.71	2.98	23.05	32.29
Chipinga ...	4.41	2.19	21.84	32.63
Lettie Swan ...	4.65	2.76	18.88	n.s.
Melsetter ...	3.95	3.04	23.64	34.71
Mount Selinda ...	8.57	5.18	29.89	43.34
Vermont ...	7.03	...	...	44.60
Umtali—				
Cloudlands ...	3.90	5.98	27.07	n.s.

Dates of Meetings of Farmers' Associations, Southern Rhodesia.

Name of Association.	Place of Meeting.	Secretary.	April.	May.
			1930	1930
Ayrshire—Sipolilo	Various farms	G. H. Cautherley	12	10
Banket Junction	Banket Hotel	A. M. Hutchinson	4	2
Beatrice District	Farmers' Hall, Beatrice	W. Krienke	24	29
Bindura	Bindura Farmers' Hall	W. E. Fricker	11	9
Bromley	Farmers' Hall, Bromley Siding	E. Taylor	2	7
Bubi	Queen's Mine	W. H. Perham	18	16
Bulawayo Landowners' and Farmers' Association	Library Buildings, Bulawayo	T. B. Hepburn	1	6
Chakari	Various farms	Lady Codrington	16	21
Daisyfield	Daisyfield (April), Somabula (May)	L. E. Edwards	19	10
Darwendale—Trelawney	Various farms	Charles H. Tanner	23	28
Eastern Districts	Farmers' Hall, Chidza	W. E. Richards	12	10
Enkeldoorn	Enkeldoorn	C. N. Ludlowe	1	6
Enterprise	Farmers' Hall	W. Stobart	1	6
Essexvale	Essexvale	Col. D. Judson	20	18
Felixburg—Gutu	Makowries (April), Glenary (May)	E. C. Fleetwood	12	10
Figtree Branch, R.L. and F.A.	Figtree Hotel	The Secretary	1	6
Gadzema	Gadzema Hotel	H. G. M. Liddell	11	9
Gatooma	Speck's Hotel	Col. J. A. Smith	19	17
Gatooma (Golden Valley Branch)	Golden Valley Hotel	C. K. James	12	10
Gazaland (South Melsetter)	Farmers' Hall, Chipinga	J. Ward	19	17
Greystone	Quarrie Farm	P. J. van der Walt	...	10
Gwanda	Lowenthal's Building, Gwanda	N. J. B. Nilson	19	17
Hartley	Hartley Hotel	Mrs. F. C. Watson	12	10
Headlands	Headlands	J. A. Eve	...	...
Hunter's Road	Hunter's Road	R. W. Twilley	26	31
Insiza South	Farm Lancaster	J. Campbell	10	...
Inyazura	Inyazura	W. P. Frudd	4	...
Lalapansi	Lalapansi	B. J. Ingle	12	10
Lomagundi	Sinoia	F. W. Robertson	11	...
Lomagundi West	Various farms	A. A. Bisset	13	11
Macheke	Various farms	R. O. Jackson	...	...

Macheke Valley (Headlands) Farmers' and Tobacco Growers' Association	Various Farms	T. R. Colam	5	3
Makwiro	Makwiro	W. L. Parsons	18	16
Marandellas	Marandellas Farmers' Hall	E. Cruikshank	4	2
Marandellas, Southern	Various farms	B. V. Cherry	2	7
Mashonaland	Mashonaland Farmers' Hall, Salisbury	P. Wilson	11	9
Matobo South	Farmers' Hall, Malundi Farm	A. G. Allan	19	17
Matopo Branch, R.L. and F.A.	Farmers' Hall, Malundi	W. Mirtle	19	17
Mazoe (Concession)	Various farms	Douglas Southey	11	9
Mazoe (Glendale)	Farmers' Hall, Glendale	James S. Brown	9	14
Melsetter	Court House, Melsetter	J. C. Kruger	10	8
Midlands Farmers and Stockowners	Royal Hotel, Gwelo	T. R. van Rooyen	9	14
Ngezi-Umniati	Harvieston, Enkeldoorn	Miss Harvie	26	31
North Melsetter	Pieter's Hoek (April)	P. J. de Bruyn	12	...
North Umniati	———	J. F. Eagar	Not	received
Norton and Lydiate District	Norton	A. Jones	4	2
Nyamandhlovu	Nyamandhlovu	R. D. McLean	...	...
Odzi District Farmers	Odzi Hotel	M. Goldberg	5	3
Poorte Valley	Various places	A. D. Wilson	19	17
Que Que	Offices of the Que Que Sanitary Board	A. A. Ackerman	19	17
Rusape Farmers' Association	Rusape	E. C. Harrington	5	3
Salisbury South	Various farms	P. Linton	30	28
Shamva	Shamva Court House	L. M. S. Paxton	18	16
Shamva North	Various farms	Mrs. E. J. Stevenson	19	...
Two Rivers Farming Association	Various farms	W. L. Parsons	19	17
Umboe (Branch of Lomagundi F.A.)	Various farms	G. T. Gover	12	10
Umvukwe Farmers' and Tobacco Growers' Association	Various ranches	———	12	10
Umtali	Drill Hall, Umtali	A. Howat	3	1
Umvuma and District	Court House, Umvuma	S. T. Montgomery	18	16
Victoria	Victoria	G. E. Lamb	5	3
Wankie District	———	F. H. Going	Not	received
West Umvukwe Farmers' Association	Various farms	G. H. Gordon	5	3
Western	Plumtree Hotel	The Secretary	12	10
Willoughbys	Willoughbys	A. E. Roberts	Not	received

Export of Cattle from Southern Rhodesia, 1930.

Month	Union		England.	Congo		N. Rhodesia.		Portuguese East Africa.		Total
	Slaughter		Slaughter							
	Johannesburg	I.C.S. for overseas	On hoof	Slaughter	Breeding	Slaughter	Breeding	Slaughter	Breeding	
January ...	...	...	...	2,449	67	...	...	...	...	2,516
February ...	...	...	...	3,438	8	537	91	...	11	4,085
March ...										
April ...										
May ...										
June ...										
July ...										
August ...										
September ...										
October ...										
November ...										
December ...										

Farming Calendar.

April.

BEE-KEEPING.

The notes given for last month will in the main apply to April also, according as to how the season develops. Last year, for instance, the honey flow in Northern Rhodesia was much protracted and the bees were busy storing until well on in May. New swarms are not recommended to be hived during this month unless they are supplied in the first instance with fully drawn out frames and the owner is prepared to feed them now and again during the winter. As April should be a very active month for the bees, watch carefully the progress of the crates in which surplus honey is being stored, and have plenty of frames—fully drawn out if possible—ready fixed with foundation so as to place on extra crates as occasion may require; these should be placed under the full or filling one and not on the top, as might appear the case. For the benefit of those who would like a little honeycomb, it might be stated that if two or three shallow frames are fitted with four empty comb sections, and placed in the crate, the bees will take to this plan and so provide both comb and honey for extraction in the one crate. In this African climate full crates can be left on the hive with safety until ready for extraction, but if any are taken off they must be watched now and again until they are extracted for damages from the wax moth, which in a day or so can ruin both the comb and honey. Will apiarists this month take particular note as to any Sunn hemp crop they may have? This plant may be rich in nectar, and much valuable information might be obtained if this is the case, as the crop is being planted on an increasing scale.

CITRUS FRUITS.

During the first half of this month, autumn budding can still be performed if the sap is still up and the bark of the stock slips freely. Unprofitable and off type trees that have been headed back for top working and which have been carefully thinned out may have the shoots on which February-March buds have failed re-budded to profitable varieties. If the March rains have been sufficient and ploughing and cultivation have been completed, continue cultivation to retain soil moisture and destroy winter weeds. If a dry March has been experienced and cultivation has been badly performed, irrigation should be commenced or continued to keep the trees and fruit in good order. If not already applied to the unthrifty trees which are late with their autumn flush, soluble fertilisers containing nitrogen and phosphoric oxide can be applied with advantage to these trees. The fertiliser should be worked into the soil with a cultivator and followed up with an irrigation. Exporters should have everything in readiness for packing the early fruit, which should be fit to market about the end of the month. Scale infested fruit will be unfit for export unless treated at once. See entomological notes for treatment.

CROPS.

If sufficiently mature, begin cutting and stooking early maize over a small acreage and plough up the ground whilst still damp between the

rows of stooks. If ripe, reap and husk early planted maize, and keep in a separate dump. Continue to make field selections of the best maize plants, and mark those required for seed with strips of coloured cloth. Lift any ground nuts and potatoes showing signs of making second growth. Make silage; cut maize for this when the ears are in the "dough" stage. Pick up and stook maize plants blown over to protect the ears from white ants. Feed sweet potato vines to stock, reserving any new growth of vines for feeding as grazing in May. Plough in any green manure crops not already turned under. Plough fallowed land. Keep potatoes reserved for seed on racks in a cool place protected from frost, but well ventilated. Transplant onions from seed-beds to irrigated or naturally moist lands; irrigate about once a week, but do not apply too much water. Pick over potatoes which may be lifted, and remove the bad and diseased ones. Winter cereal crops for grain can be sown towards the end of the month. Cart manure to the lands. Remember that good and deep ploughing to a depth of at least 7 to 8 inches is essential, and the basis of all successful arable farming. If the lands are not already ploughed so deep, increase the depth of ploughing about an inch a year until this depth, or even more, is reached. On lands which have been ploughed for a number of years at the same depth, use a grubber to stir up the sub-soil without lifting it to the surface. Too much attention cannot be paid to good tillage. It is usually good practice to follow the plough at once with a harrow or other suitable implement to break down the clods before they bake hard. Continue breaking up new lands; the earlier this is done the more complete is the decomposition of the vegetable matter in the soil. When making hay of coarse legumes such as velvet and dolichos beans and cowpeas, be sure that the vines are dry before stacking. Handle the hay as little as possible to avoid loss of leaf. Thought should be given to laying in supplies of thatching grass for thatching and repairing roofs. The veld may be beginning to dry off. Consideration may be given to mowing or otherwise preparing fire lines as a preventive against veld fires.

DAIRYING.

At this season of the year the milking kraal is generally far from clean owing to the excessive amount of mud or dust which has accumulated during the latter part of the rainy season, and in consequence farmers invariably have trouble in producng first-grade cream. Every endeavour should be made to erect a small milking shed in which four or five cows or more can be milked at a time, and every effort should be made to keep the cows clean. The udders should be wiped before milking with a clean, damp cloth, and the farmer should see that the natives' hands are washed with soap and clean water before and after each milking.

If butter is made, the cream and washing water should be put out overnight, and if the cream is churned early the following morning, very little difficulty should be experienced in obtaining a good grain and a firm body in the butter.

From this time of the year onwards, cheese making operations are usually most successful. The evening's milk should not be kept in the dairy, but should be placed outside, preferably in a bath, and covered over with butter muslin, cheese cloth or mosquito gauze netting. Care should always be exercised, however, in using evening's milk. Morning's milk plus a starter usually gives the best quality, and if a starter is used, care should be taken that it shows no signs of gasiness or off flavours.

The season of abundant green pasture is over, and the natural grazing, unless supplemented by some green food or succulent roughage, is not sufficient to maintain a full flow of milk. The most economical supplement to veld grazing at this time is maize silage, and this should be fed in liberal quantities to all milking cows and growing stock. A few pounds of concentrates in addition would also be of great benefit to the milking cows, which should not be compelled to subsist entirely on veld hay and silage.

DECIDUOUS FRUITS.

If not already done, orchards should be ploughed, harrowed and well cultivated to retain the soil moisture for spring blossoming and growth. Varieties such as the Chinese peaches, etc., may be pruned after the leaves have dropped.

Order all trees for winter planting during June-July. August planting is unsafe for many early growing varieties of fruits.

All late apples should be harvested and stored or marketed.

ENTOMOLOGICAL.

Maize.—Although certain pests, such as earworm and stalk borer, may be in evidence, there are practically no operations against insect pests that can be carried out economically during this month.

Tobacco.—Any remaining plants showing stem borer attack should be removed and burnt. Watch should be kept for emergence of the adult wire worm beetle. These should be poisoned with Paris green in the proportion of 1 lb. to 200 lbs. of maize meal. The bait should be spread on the land in small heaps early in the morning and shaded from the sun.

Cotton.—Damage to bolls from bollworms may be betrayed by the dropping of the bolls attacked. These should be collected and burnt. Cotton stainers should be destroyed by hand collecting. Guinea fowl, turkeys, etc., may be encouraged about the land to destroy stainers and other insects.

Citrus.—Collect and destroy infested fruit to keep down citrus codling moth. Red scale should be destroyed by fumigation with hydrocyanic acid gas. Soft brown scale may be controlled by spraying with resin wash. If unseasonable young growth appears, aphis may develop and must be kept suppressed to prevent soiling of the fruit with black fungus.

Vegetable Garden.—Plants of the cabbage family are liable to suffer severely from cabbage louse and Bagrada bug. The former can be kept largely suppressed by frequent washings with a strong spray of cold water. Bagrada bug is difficult to fight, but carbolic emulsion and resin wash have been recommended as sprays elsewhere. These washes must be applied directly to the insects, and the immature stages are more readily killed than the adults.

Potatoes should be cultivated systematically and hilled to keep the tuber moth from the tubers.

FLOWER GARDEN.

The garden can generally be depended upon to make a good show in the autumn and early winter, provided that the plants have been previously kept in a healthy condition by watering, mulching and feeding. Snap dragons and other seedlings, also cuttings, may now be planted out into their permanent positions. Sowing may be made of hardy annuals, such as hollyhocks, larkspur, clarkia, pansy, petunia, sweet peas, gaillardia and candytuft. Bulbs of spring flowering plants may be taken up, divided and replanted.

VEGETABLE GARDEN.

Sow at once all that is required to fill up the vegetable garden before the soil has parted with all moisture. Seeds sown now will germinate freely, and plants will establish themselves more quickly than during the colder weather, which can soon be expected. A start should now be made at cleaning asparagus beds. This is a most popular vegetable, and yet one rarely sees it cultivated in the ordinary Rhodesian garden. It is supposed to be difficult to grow, but this supposition is not borne out, as, once established, a bed of asparagus is one of the most easily managed vegetables in the whole garden. Depth of good soil and plenty of manure are all that this plant requires. Rhubarb roots may be taken

up, divided and replanted this month. Plant out from seed beds cabbage and onion plants into their permanent quarters. Sow a full crop of peas, broad beans, turnips, onions, lettuce and radish.

FORESTRY.

Cultivate the soil in the young plantations either by means of machines or hand labour. The cultivation will conserve moisture. Hoed out weed growth should be applied as a mulch round the base of each young tree. Be careful not to pile earth round the stems of the young trees. Covering the stems with earth even for an inch or two interferes with sap circulation and invites attacks by termites.

Prune the young trees to single stems. Any strong undesirable branch growth may be checked by breaking off the leading shoot.

POULTRY.

The first chicks should now be out, and these, having been hatched, must be well looked after. No food should be given for the first 36 to 48 hours. Leave them to sleep as much as possible. See that they have plenty of fresh warm air, but are not exposed to draughts. After 48 hours give some small grit and charcoal to purify the intestinal tract and aid digestion. A pamphlet dealing very fully with incubation and rearing of chickens can be obtained gratis on application to the Poultry Experts, Department of Agriculture.

One comes across many cases of wrong treatment of chickens in this country, the chief being uncleanliness, over-crowding, giving food too early and dirty drinking water. Two most important foods are animal protein, especially in the form of thick separated or whole milk and green food, especially onions or eschalots or their green tops. The loss in the rearing of chicks is very great; this should not be so if good breeding stock is used, the eggs from these are carefully handled and incubated and the chicks reared with care and common sense.

Any turkey chicks hatched at this time of the year should be well looked after. They should be kept warm, dry, free from insects, fed on dry food only, given plenty of thick separated milk, onions or onion tops, dry mash and grain. A pamphlet on turkeys and turkey rearing is obtainable gratis from the Poultry Experts.

Ducks should do well during the month, the weather being as a rule cool, moist and bracing; but the houses in which they sleep must not be damp. Duck breeders should always be on the "qui vive" for a round worm called "Trichosoma contortum," which is often fatal to ducks. It is found in the œsophagus, and causes arrest of growth, emaciation and weakness and sometimes epileptiform attacks. A swelling will be noticed at the lower part of the neck, which rapidly increases in size, and death occurs in one to three days. Onions, or preferably garlic, mixed with the food is a good preventive and cure. Another good remedy is essence of turpentine mixed with twice its quantity of olive oil and one or two tablespoonfuls given for a dose.

TOBACCO.

The grading of the brighter grades should be proceeded with as soon as convenient. All leaf which has cured green should be bulked separately and be regularly examined to avoid serious damage through overheating. Tobacco seed heads, when mature, should be removed from the plants and stored where no damage will occur through activities by rats and mice. Care should be taken to store these seed heads with the pods uppermost, as otherwise much seed may be lost. Clear and plough the land soon after the crop has been harvested. Burn old stalks as a control measure against possible carry over of disease.

May.

BEE-KEEPING.

Last month under normal conditions should have seen the last honey flow of the season almost ready for robbing, for which purpose have the extractor overhauled, spare crates available, bee escape boards ready, honey jars and bottles ready for usage, and also have a few spare quilts on hand. Do not rob the bees of too much honey, remembering that sending them into winter quarters with a sufficiency of food means a strong issuing colony in the spring. Any new swarms that it may be decided to add to the apiary, feed well if necessary, to induce stimulative breeding while there is time, or if new young queens have replaced older ones also feed liberally this month in the proportion of one part of cane sugar to two of water; for the somewhat wild Rhodesian bee there is nothing like the Alexander feeder let in from the back. Keep all the spaces under hive stands clean, also inspect daily to see that white ants are not building up from the soil; if this is neglected much loss may follow. When seen, sprinkle diluted kerol from a watering can under the hive stand.

Granulation in the bottled honey can be prevented by first ripening the extracted honey in large tins covered with butter muslin for three or four days by exposure to the sun's rays. It should then be heated to a temperature of 150-160 degrees—nothing higher. As soon as this is reached withdraw the tins and bottle when cooling. The best way to obtain this heating is to place the tins in another receptacle of cold water and boil it up to the required heat, as heating it direct over a fire is very liable to burn the contents or to impair the delicate flavour of the natural honey.

CITRUS FRUITS.

The harvesting of the early ripening fruit should be commenced about the first week in May. Exporters should cure their Washington Navels for a longer period than usual; this will enable them to detect the thick skinned fruit easily. Where necessary, irrigation should be continued up to within ten days of harvesting. All ploughing and cultivation should be completed without delay.

CROPS.

Continue to cut and stook maize as it matures; make the stooks small to assist drying. Later in the season the stooks may be made larger. See that the stooks are secure and pick up plants lying on the ground. Continue to plough up land between stooks of maize. Give all maize harvested, whether husked or in the husk, a chance to dry out before riding to the dumps. Do not begin shelling if the ears are still damp. Do not use new grain bags for harvesting maize. Make the dumps of unhusked ears as small as possible; the smaller the dump the quicker the grain will dry out. Grain on the cobs dries extremely slowly, if at all, in dumps of large size. Do not mix unhusked ears from the stooks with dryer ears harvested later from the standing crop. Keep the dryer ears in a separate dump; shell, bag and stack such maize separately. When cutting maize for stooking, insist on the stalks being cut within 2 to 4 inches of ground level. The plough, in Rhodesia, will not bury roots with stalks 8 to 12 inches high. A long stubble of stalks makes clearing of the ground for ploughing very tedious and expensive. If not already harvested, ground nuts should be lifted before the first frosts damage the hay. Finish transplanting onions from seed-beds. If plants are not flourishing after transplanting, give a light dressing of nitrate of soda—50 lbs. per acre. Repeat in a fortnight

if needed. Sow most winter cereals on wet vleis or under irrigation early this month. Feed your sweet potato vines to stock; if frosts occur the vines will be killed. Dig and feed tubers from end of month onwards. Towards end of month harvest cattle pumpkins and melons and handle carefully; avoid bruising to prevent rotting. Place pumpkins and melons in a dry situation in the open and in a single layer. Supply plenty of roughage to cattle pens, kraals and stables to increase the manure supply. Collect and cart manure to lands for spreading. Do not attempt to plough in dry grass or quantities of maize refuse. The plough will not turn it under and it will not rot before next planting season. Burn such refuse and make a good job of the ploughing. If the weather seems set fair, commence brick-making. A small kiln of bricks always on hand is most useful. As labour permits, re-thatch buildings and outhouses in need of repair. Overhaul, grease and paint planters, drills and other implements not required again until next season, and store away under cover. Think about your fertiliser requirements for next season and place your orders. From now onwards the second ploughing of new land broken up earlier in the season should be pushed on with as opportunity offers.

DECIDUOUS FRUITS.

The pruning of early ripening peaches should be performed this month. All holes should be completed and kept in readiness for June planting. Ploughing or digging and cultivation should be completed without delay.

ENTOMOLOGICAL.

Cabbage Family.—Plants of this family are liable to suffer greatly from cabbage louse and Bagrada bug during May. For the former, spray with soap and tobacco wash, which may help if the plants are not too big.

Dhal.—Blister beetles are still injurious to the blossom of the crop, and should be regularly collected and destroyed.

Citrus Trees.—Continue to collect and destroy all fruits infested with citrus codling.

Guava.—Fruit fly and citrus codling breed in these fruits during the autumn and winter.

Tobacco.—Watch should be kept for emergence of the adult wireworm beetle. These should be poisoned with Paris green in the proportion of 1 lb. to 200 lbs. of maize meal. The bait should be spread on the land in small heaps early in the morning, and shaded from the sun.

FLOWER GARDEN.

The month of May is a suitable one for the preparation of new flower beds. The ground should be well trenched, and if of poor quality, a light dressing of well rotted manure will be a distinct advantage. Too heavy dressing is not advised, as too rich a soil is likely to produce an abundance of foliage and very few flowers. It is not too late to sow sweet pea seeds, but the best results come from early planting. By this time all bulbs for spring flowering will be planted. Chrysanthemums, delphiniums, dahlias and other herbaceous perennials may now be cut down, and if necessary taken up, divided and replanted

VEGETABLE GARDEN.

It will be necessary during the early part of the month to clear off what remains of summer crops, such as haricot beans, peas, cucumbers, etc. Where winter deep rooting vegetables are to be grown, such as carrots, parsnips and beets, the soil and sub-soil should be deeply worked, so as to allow a ready root run for these vegetables. A dressing of lime will be of great value in every section of the kitchen garden. This will especially help to minimise future attacks of insects and fungus attacks. New asparagus beds may be made this month; old beds should be cut down, cleaned and kept in good order; also a light dressing of stable manure may be given to the beds. Planting may be made of all seedlings,

such as cabbage, cauliflower, lettuce, onions, etc., and seeds of carrot, leek, lettuce, onions, peas, radish, turnip, parsnip, broad beans may be sown.

FORESTRY.

Continue pricking out seedlings into tins. Deciduous trees which are propagated by means of cuttings should be taken in hand. See that the fire lines are in order, and in the case of woods which have formed canopy, remove inflammable material below the edge trees.

POULTRY.

All cockerel chickens should be separated from the pullets, and every month gone over carefully, the poorer ones eliminated and only the very best kept. Those cockerels with the deep long bodies, short legs and round heads should be kept. Those with any inclination to long legs, knock knees, long heads or thin beak, lop-over combs, narrow bodies, or those lacking length and depth should be rigorously discarded. The chickens must not be allowed to become chilled, especially at night; on the other hand, they must not sleep in a hot stuffy atmosphere. On no account must they be overcrowded; this is fatal and is one of the many rocks on which poultry keepers come to grief.

The young stock must have all they can eat; to stint them is to ruin them for good and all. A bird that has been stunted never recovers. Remember that they require food for heat, energy, repair of wear and tear, and to produce bone, fat, flesh, tissue, blood and feathers. A good quality bone meal (lime phosphate) is absolutely necessary, as is also plenty of succulent green food, and no animal protein is better than thick separated milk for the health and growth of the chickens.

Those going in for ducks should hatch according to the numbers they have to supply for eating each week. Ducks must have all the food they will eat from the time they are hatched. A quick-growing duck should put on 1 lb. per week and be ready for killing at from seven to eight weeks old. Always kill or sell for killing just before the large wing feathers commence to grow.

If the rains have stopped, turkeys can be hatched. See that the youngsters are kept warm, but also that they have plenty of fresh air. Never feed young turkeys on wet or moist food, but give dry mash, grain, plenty of onion tops or onions chopped small, and thick separated milk. Keep them free from insect vermin; they will never thrive if they are infested with these.

Never allow the hen that has hatched the turkey eggs to run with the youngsters. Always confine her in a coop, through the slats of which the young turkeys can run in and out. The coop should be moved to fresh ground each day; nothing is worse for young turkeys than to be running on the same piece of ground for long at a time. Tainted ground is one of the chief causes of mortality among young turkeys.

STOCK.

Cattle.—Ranching cattle may still be expected to be in good condition. In most districts it will be wise to conserve hay, maize stover, ensilage and a supply of any other cheap feed as a provision against possible late rains in the spring, and to enable one to maintain the younger or very old stock should occasion arise. By the middle of this month dairy cattle will require more serious attention in the matter of feed. Grass should be cut for bedding and both cows and calves should be well bedded down at night from now onwards, and cowsheds should be put in good repair. Attention should be given to the water supplies and care taken that they are clean and sufficient.

Sheep.—If the vleis have dried, sheep may be allowed into the lower lying veld. If the rams are put in now, lambs will arrive in October, which is usually a good month to arrange for. Those who favour winter

lambs and have ewes lambing now will find a few handfuls of maize, together with chopped maize stalks or any other kind of available roughage or green stuff, a great help to the ewes in providing milk.

TOBACCO.

Curing should be completed as early in the month as possible to prevent loss from frost. The bales of tobacco should be examined and turned weekly until they are despatched from the farm. All bulks must be inspected regularly and turned if necessary. Tobacco seed should be shelled as soon as the seed pods are dry and the seed carefully labelled and stored in a dry place. The stumping, clearing and ploughing of new land, if operations have not already been commenced, should be no longer delayed. Land which has just produced a crop should be ploughed and harrowed as soon after the harvest as possible.

VETERINARY.

Horse-sickness will still be in evidence, and may be expected to continue until the frosts occur. Inoculation for blue tongue should be performed in the dry season only, unless the animals can be kept under cover for 21 days. Do not inoculate ewes in lamb on account of abortion. Inoculated animals spread the disease for 21 days. Scab is a poverty winter disease.

WEATHER.

During the major portion of this month the ordinary winter conditions prevail, viz., cloudless sunny days and cold nights. Frost may be normally expected at any time during the latter half of the month. There is often, however, a recrudescence of rain conditions during the early portion of the month, resulting in overcast days and light drizzling showers, the normal rainfall at many places, particularly in the southern and eastern portions of the country, amounting to over half an inch.

Notes from the "Gazette."

"Gazette" Date.	*Items.*
	AFRICAN COAST FEVER.
	Native District of Mazoe.
28.2.30.	Government Notice No. 128 releases the farms Chomkuti, Dunaverty, Dundry, Brawlands, Laurencedale, Georgia, Bretton, Granite, Whitecliffe (Nos. 16 and 17) and farms Nos. 20 and 13.
	NATIVE DISTRICT OF CHARTER.
14.3.30.	His Excellency the Governor-in-Council has been pleased, under the provisions of the "Animals Diseases Consolidation Ordinance, 1904," to cancel Government Notice No. 365 of 1929, and to declare, in terms of section 15 of Government Notice No. 641 of 1927, the following areas of infection and guard areas:—
	(a) Area of Infection.
	The farm Victor.
	(b) Guard Area.
	An area bounded by and including the following farms:—Girliesdale, Swindon, Money Putt, Maranu Mashanu, Muckleneuk, Girliesfontein A and Girliesfontein B.

"Gazette" Date.	Items.
	(a) Area of Infection.
	The farm Inhoek.
	(b) Guard Area.
	An area bounded by the farms Sable, Lemoenfontein, that portion of Nyamazaan known as Hoffmania, Ricefontein, Dampan; thence by a line drawn from the south-west beacon of the latter to the south-eastern beacon of Sterkstroom; thence along the southern boundary of this farm to its south-western beacon; thence by a line from this beacon to the north-western beacon of Sable Flat; thence up the Umniati River to the western beacon of Inhoek; thence along the western boundary of the farm to Railway; thence by and including Railway, Onzerust, Rooibokfontein and Elminie to the first-mentioned farm. (G.N. No. 162.)
	POUND.
14.3.30.	A pound has been established at Farnley farm, Hartley district, from 1st April, 1930.
	HEARTWATER.
28.2.30.	His Excellency the Governor-in-Council has been pleased, under the provisions of the "Animals Diseases Consolidation Ordinance, 1904," to cancel Government Notice No. 439 of 1929, and declare the areas defined in the schedule annexed hereto as infected with heartwater, and to make the following provision for the purpose of preventing the spread of infection of the said disease:—
	Notwithstanding the provisions of any regulations dealing with the movement of cattle, sheep and goats, no cattle, sheep or goats shall be removed from the said areas unless such cattle, sheep and goats are free from bont tick, Amblyomma hebraeum and variegatum.
	Schedule.
	1. The Gwanda native district.
	2. The Chibi native district.
	3. The Belingwe native district, excluding that portion lying north of the Belingwe Reserve.
	4. That portion of the Bulalima-Mangwe native district lying south and including Raditladi Reserve, farm Romney and Reserve, Mphoeng's Reserve, farms Lewisdale, Thornville and Lion's Park.
	5. In the Nyamandhlovu native district, the Gwaai Reserve, the farm Gutamegwa and unalienated land.
	6. That portion of the Bubi native district lying north and including the following farms: Drysdale, Braemar Block, Wynslay Estate, Dollar Block, Crescens Bubi Block, Kenilworth Extension, Sunny Ranch and Longwe Block.
	7. The Wankie native district.
	8. That portion of the Matobo native district including and lying south of the Shashani Native Reserve, Stutterlingen, Pudzo, Dope, Inkonyana and Reserve. (G.N. No. 129.)

Departmental Bulletins.

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AGRICULTURE AND CROPS.

No. 174. Notes on Hop Growing, by H. G. Mundy, F.L.S.
No. 218. Useful Measurements for Maize, by J. A. T. Walters, B.A.
No. 225. Napier Fodder or Elephant Grass, by J. A. T. Walters, B.A.
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No. 545. Artificial or Synthetic Farmyard Manure, by H. G. Mundy, Dip.Agric., F.L.S.
No. 550. Onion Growing under Irrigation, by C. Mainwaring.
No. 561. Wheat Growing in Rhodesia, by C. Mainwaring.
No. 568. The Treatment of Arable Land, by G. N. Blackshaw, O.B.E., B.Sc., F.I.C.
No. 581. Leguminous Crops for Stock and Soil Improvement in Southern Rhodesia, by C. Mainwaring, Agriculturist.
No. 590. Rye, by H. W. Hilliard, Junior Agriculturist.
No. 591. Maize Export Conference Proceedings.
No. 598. Drought-resistant and Early-maturing Crops for Areas of Late Rainfall, by C. Mainwaring.
No. 599. Rhodesian Soils and their Treatment, by E. V. Flack.
No. 601. Maize for Export, by S. D. Timson.
No. 603. The Production of Maize in Southern Rhodesia, by C. Mainwaring, Agriculturist.
No. 627. The Growing of Potatoes in Southern Rhodesia (Revised), by C. Mainwaring, Agriculturist.
No. 630. The Storage of Seed Potatoes, by H. C. Arnold.
No. 634. Barley, by P. V. Samuels.
No. 643. Noxious Weeds in Southern Rhodesia, by F. Eyles, Botanist.
No. 650. Coffee Culture in Southern Rhodesia, by G. W. Marshall, Horticulturist.
No. 651. Two Important Leguminous Crops: The Velvet Bean and Dolichos Bean, by C. Mainwaring, Agriculturist.
No. 656. Tractor Notes, by A. W. V. Crawley, M.E., F.G.S.
No. 657. Hay-making in Southern Rhodesia, by C. Mainwaring, Agriculturist.
No. 663. The Use of Fertilisers and Manures in Southern Rhodesia, by A. D. Husband, A.I.C., Chief Chemist.
No. 672. Hay-making in Rhodesia, by H. G. Mundy, Dip.Agric., F.L.S.
No. 674. Top Dressing of Maize against Stalk Borer, by H. C. Arnold.
No. 681. The Sunflower (Helianthus Annuus) (Revised), by S. D. Timson, M.C., Dip.Agric.

No. 684. Warning to Maize Growers : Maize for Export.
No. 685. Notes on Farm Practices at the Government Farm, Gwebi, by S. D. Timson, M.C., Dip.Agric.
No. 694. The Edible Canna (Canna Edulis), by D. E. McLoughlin.
No. 695. The Castor Oil Plant (Ricinus spp.), by S. D. Timson, M.C., Dip.Agric.
No. 697. Results of Analysis of Samples taken under the "Fertilisers, Farm Foods, Seeds and Pest Remedies Orrdinance" during the year 1927-28.
No. 700. Further Notes on Farm Practice at the Government Farm, Gwebi, by S. D. Timson, M.C., Dip.Agric.
No. 704. The Importance of Research on Pasture Improvement in Southern Rhodesia, by A. D. Husband, A.I.C., Chief Chemist.
No. 705. Suggested Cropping Programmes for Farms on the Sand Veld, by D. E. McLoughlin, Assistant Agriculturist.
No. 706. A Farmers' Calendar of Crop Sowings, by C. Mainwaring, Agriculturist.
No. 708. Witch Weed or Rooibloem (Striga Lutea)—a Serious Menace to Maize, by J. A. T. Walters, B.A., F.R.S.A., Agriculturist.
No. 709. Sand Veld Farming and its Possibilities, by E. D. Alvord, M.Sc. (Agr.).
No. 710. Monthly Reminders for the Farming Year, by the Division of the Chief Agriculturist.
No. 713. Ensilage, by J. A. T. Walters, B.A., Agriculturist.
No. 724. Ploughing by Tractor, by A. W. V. Crawley, M.E., F.G.S.
No. 727. Farmyard Manure, by A. P. Taylor, M.A., B.Sc., Agricultural Chemist.
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No. 750. Cotton in Southern Rhodesia—Hints to Growers, by G. S. Cameron, Empire Cotton Growing Corporation.
No. 751. The Sweet Potato, by S. D. Timson, M.C., Dip.Agric. (Wye).
No. 757. Maize on the Sand Veld : Results at the Tobacco Experiment Station, Salisbury, by C. A. Kelsey-Harvey, Manager.
No. 758. Instructions for Taking Soil Samples. Issued by the Division of Chemistry.
No. 759. Witch Weed (Striga Lutea) : Methods of Control, by S. D. Timson, M.C., Dip.Agric. (Wye).
No. 762. The Value of Rock Phosphate and "Bone and Superphosphate" as Fertilisers for Maize Production, by A. D. Husband, Chief Chemist.
No. 768. The Ground Nut (*Arachis hypogaea*), by S. D. Timson, M.C., Dip.Agric. (Wye).
No. 775. Agricultural Costings at the Gwebi Farm, by H. G. Mundy, Dip.Agric., F.L.S., Chief Agriculturist, and J. Hick, Accountant.
No. 776. Regulations Governing the Export of Maize and Maize Meal through the Port of Beira.
No. 777. Some Aspects of Cost of Production Studies in Agriculture, by Arthur G. Ruston, D.Sc., Department of Agriculture, Leeds University.

Botanical Specimens for Identification.
Maize Grading Regulations.
Accelerating the Sprouting of Potatoes.

REPORTS ON CROP EXPERIMENTS.

No. 94. Second Report on Experiments, by J. H. Hampton.
No. 216. Manuring of Maize on Government Experiment Farm, Gwebi, by A. G. Holborow, F.I.C.
No. 220. Reports on Crop Experiments, Gwebi, 1914-15, by E. A. Nobbs, Ph.D., B.Sc.
No. 221. Results of Experiments, Longila, 1914-15, by J. Muirhead.

No. 239. Reports on Crop Experiments, Gwebi, 1915-16, by E. A. Nobbs, Ph.D., B.Sc.

No. 246. Reports on Crop Experiments, Gwebi, 1915-16, Part II., by E. A. Nobbs, Ph.D., B.Sc.

No. 268. Manuring Maize, Government Farm, Gwebi, by A. G. Holborow, F.I.C.

No. 279. Report on Crop Experiments, Gwebi, 1916-17, by E. A. Nobbs, Ph.D., B.Sc.

No. 341. Report on Crop Experiments, 1918-19, Gwebi Experiment Farm.

No. 342. Rotation Experiments, 1913-19, by H. G. Mundy, F.L.S., and J. A. T. Walters, B.A.

No. 382. Annual Report of Experiments, Experiment Station, Salisbury, 1919-20.

No. 405. Annual Report of Crop Experiments, 1920-21, Gwebi Experiment Farm, by H. G. Mundy, F.L.S., and J. H. Hampton.

No. 411. Annual Report of Experiments, 1920-21, Experiment Station, Salisbury, by H. G. Mundy, F.L.S.

No. 413. Arlington Sand Veld Experiment Station, First Report, by H. G. Mundy, F.L.S., and E. E. Wright.

No. 432. Bulawayo Municipal Experiment Station, First Report, by H. G. Mundy, F.L.S.

No. 433. Winter Cereal Experiments, 1921, by D. E. McLoughlin.

No. 437. Annual Report of Crop Experiments, Gwebi Experiment Farm, 1921-22, by H. G. Mundy, F.L.S.

No. 440. Annual Report of Experiments, 1921-22, Experiment Station, Salisbury, by H. G. Mundy, F.L.S.

No. 485. Annual Report of Experiments, 1922-23, Agricultural Experiment Station, Salisbury, by J. A. T. Walters, B.A.

No. 486. Bulawayo Experiment Station, Annual Report for Season 1922-23, by H. G. Mundy, F.L.S.

No. 514. Bulawayo Experiment Station Report, 1923-24, by H. G. Mundy, F.L.S.

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No. 564. A Maize Rotation Experiment, by A. R. Morkel.

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No. 608. Annual Report of Experiments, 1924-25, Agricultural Experiment Station, Salisbury, by H. G. Mundy, Dip.Agric., F.L.S.

No. 631. Bulawayo Experiment Station: Annual Report for Year 1925-26, by H. W. Hilliard.

No. 649. Annual Report of Experiments, 1925-26, Agricultural Experiment Station, Salisbury, by H. C. Arnold, Manager.

No. 675. Bulawayo Experiment Station—Annual Report for Year 1926-27, by D. E. McLoughlin.

No. 683. Annual Report of Experiments, 1926-27, Agricultural Experiment Station, Salisbury, by H. C. Arnold, Station Manager.

No. 688. Report, 1923-24—1926-27, Gwelo Municipal Demonstration Stations, by D. E. McLoughlin.

No. 716. Report, 1927-28, Gwelo Municipality Demonstration Stations, by S. D. Timson, M.C., Dip.Agric.

No. 745. Salisbury Agricultural Experiment Station Annual Report, 1927-28, by H. C. Arnold.

No. 767. Gwelo Municipal Demonstration Stations. · Annual Report for the Season 1928-29, by D. E. McLoughlin.

No. 773. Bulawayo Municipal Demonstration Station: Report for the Seasons 1927-28 and 1928-29, by D. E. McLoughlin, Assistant Agriculturist.

TOBACCO.

No. 605. Flue-Curing Tobacco Barns, Bulking and Grading Sheds, by P. H. Haviland, B.Sc. (Eng.), Acting Government Irrigation Engineer.
No. 607. Tobacco Seed Beds, by D. D. Brown.
No. 615. The Culture of Virginia Tobacco in Southern Rhodesia—Field Management, by D. D. Brown.
No. 617. Dark Fire-Cured Tobacco, by E. M. Matthews, B.Sc., Tobacco Adviser. Fire-Curing Tobacco Barn, by the Tobacco Advisers.
No. 629. Notes on Flue Curing of Tobacco, by C. A. Kelsey Harvey.
No. 641. The Handling, Grading and Baling of Cured Virginia Tobacco, by D. D. Brown.
No. 644. Tobacco Baling Boxes, by B. G. Gundry, Irrigation Branch.
No. 653. The Care of Tobacco Seed Beds, by J. C. F. Hopkins, B.Sc. (Lond.), A.I.C.T.A. (Trinidad).
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No. 665. Tobacco Pests of Rhodesia, by Rupert W. Jack, F.E.S., Chief Entomologist.
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No. 774. Dark Fire-cured Tobacco: Harvesting and Curing, by D. D. Brown, Chief Tobacco Expert.

STATISTICS.

No. 196. Collection of Agricultural Statistics in Southern Rhodesia, by Eric A. Nobbs, Ph.D., B.Sc.
No. 209. The Agricultural Returns for 1914, by B. Haslewood, F.S.S.
No. 224. Statistical Returns of Crops in Southern Rhodesia for the Season 1914-15, by E. A. Nobbs, Ph.D., B.Sc., and B. Haslewood.
No. 230. Farm and Live Stock Statistics, 1915, by Eric A. Nobbs, Ph.D., B.Sc., and B. Haslewood, F.S.S.
No. 247. Statistical Returns of Crops Grown by Europeans in Southern Rhodesia for the Season 1915-16, by Eric A. Nobbs, Ph.D., B.Sc., and Fred Eyles, F.L.S.

No. 259. Statistics of Live Stock and Animal Produce, 1916, by Eric A. Nobbs, Ph.D., B.Sc., and F. Eyles, F.L.S.
No. 281. Statistics of Crops, 1916-17, by F. Eyles, F.L.S.
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No. 322. Statistics of Live Stock and Animal Produce, 1918, by F. Eyles, F.L.S.
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No. 393. Statistics of Live Stock and Animal Produce for 1920, by H. C. K. Fynn.
No. 409. Statistics of Crops Grown by Europeans in Southern Rhodesia for the Season 1920-21, by H. C. K. Fynn.
No. 426. Statistics of Live Stock and Animal Products for the Year 1921, by H. C. K. Fynn.
No. 443. Statistics of Crops Grown by Europeans in Southern Rhodesia for the Season 1921-22, by F. Eyles, F.L.S., and H. C. K. Fynn.
No. 459. Statistics of Live Stock and Animal Products for the Year 1922, by A. Borradaile Bell.
No. 484. Statistics of Crops Grown by Europeans in Southern Rhodesia for the Season 1922-23, by A. Borradaile Bell.
No. 502. Winter Crops, 1923, by A. Borradaile Bell.
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No. 543. Statistics of Live Stock and Animal Products for the Year 1924, by A. Borradaile Bell.
No. 580. Statistics of Summer Crops Grown by Europeans in Southern Rhodesia for the Season 1924-25, by A. Borradaile Bell, Statistician.
No. 595. Statistics of Live Stock and Animal Products for the Year 1925, by A. Borradaile Bell, Statistician.
No. 626. Statistics of Summer Crops grown by Europeans in Southern Rhodesia for the Season 1925-26, by A. Borradaile Bell, Statistician.
No. 646. Statistics of Live Stock and Animal Products for the Year 1926, by A. Borradaile Bell, Statistician.
No. 682. Agricultural Returns for 1926-7 : Preliminary Returns, by Thomas G. Gibson, Government Statistician.

LIVE STOCK.

No. 227. An Experiment in Beef Production, by R. C. Simmons.
No. 245. Beef Feeding Experiment No. 2, by R. C. Simmons.
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No. 338. From Breeder to Butcher; Beef Feeding Experiment No. 5, by E. A. Nobbs, Ph.D., B.Sc.
No. 381. From Breeder to Butcher; Cattle Feeding Experiment No. 8, by Eric A. Nobbs, Ph.D., B.Sc.
No. 421. From Breeder to Butcher; Cattle Feeding Experiment No. 9, Government Experiment Farm, Gwebi, by E. A. Nobbs, Ph.D., B.Sc., F.H.A.S.
No. 446. From Breeder to Butcher; Cattle Feeding Experiment No. 11, Government Experiment Farm, Gwebi, by Eric A. Nobbs, Ph.D., B.Sc., F.H.A.S.
No. 468. From Breeder to Butcher; Cattle Feeding Experiment No. 13, by Eric A. Nobbs, Ph.D., B.Sc.

No. 483. From Breeder to Butcher; Cattle Feeding Experiments Nos. 14 and 15, Government Experiment Farm, Gwebi, by Eric A. Nobbs, Ph.D., B.Sc.
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No. 624. The Construction of Dipping Tanks for Cattle (Revised).
No. 698. The Rearing of Bacon Pigs for Bacon Factory Purposes, by T. Hamilton, M.A., N.D.A., N.D.D.
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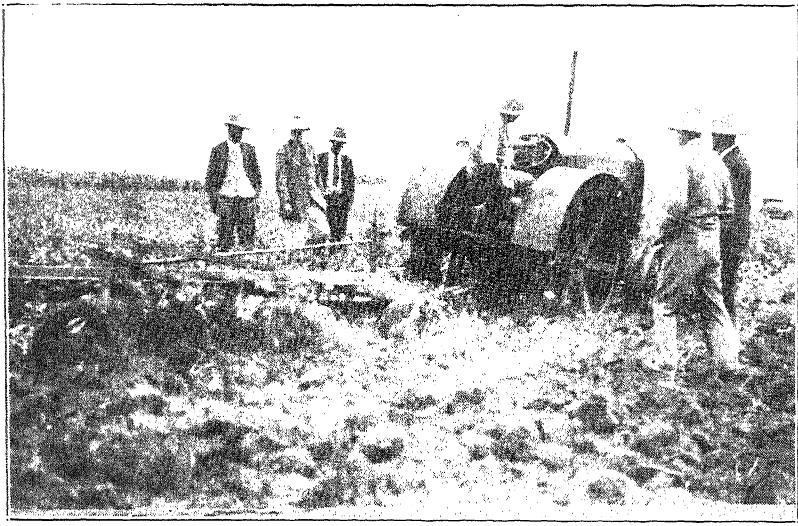
Farmers' day at Gwebi.



Farmers' day at Gwebi, 31st March, 1930.
Ploughing demonstration with "Munktells" tractor.

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Editorial.

Contributions and correspondence regarding subjects affecting the farming industry of Southern Rhodesia are invited. All communications regarding these matters and advertisements should be addressed to:—The Editor, Department of Agriculture, Salisbury.

Farmers' Day at Gwebi.—This annual event, which was held on the 31st March, attracted an unusually large attendance, numbering some 400 persons. Local farmers naturally were in strong force, but there was quite a number who had come from distant parts of the Colony, testifying to the interest manifested in the conduct of this farm. Three had come from as far afield as Melsetter.

His Excellency the Governor, the Premier and the Minister of Agriculture and Lands were present during a part of the day, while most of the technical officers of the Department of Agriculture were in attendance and answered many questions relating to farming matters.

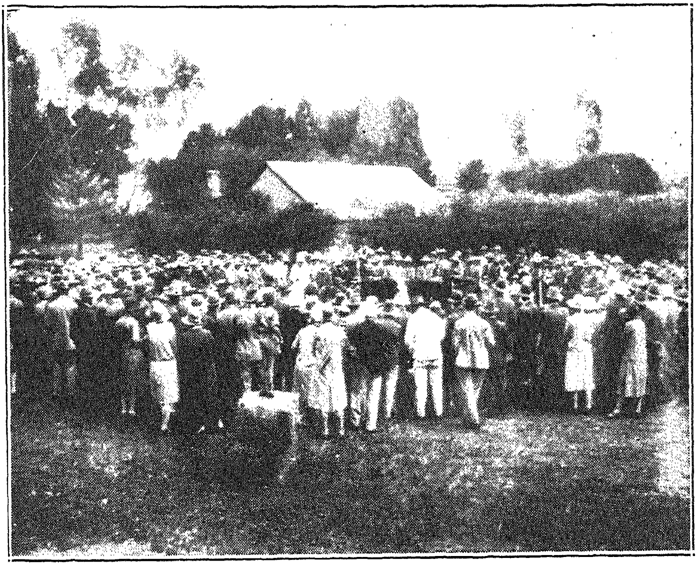
The programme followed was much the same as that of last year, the proceedings opening with a welcome by the Chief Agriculturist, followed by an inspection of the crops,

ploughing demonstrations with crude oil and paraffin tractors, luncheon, and in the afternoon sale of cattle, lectures and inspection of the live stock.

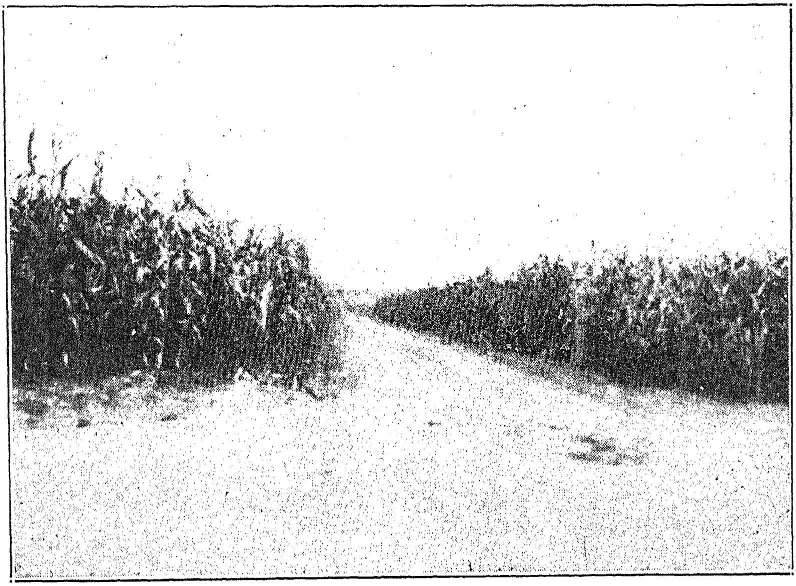
There are this year 783 acres under crops, including 467.4 acres under maize, 101.5 acres under dolichos beans, for seed, hay and green manuring, 38.4 acres under sunflowers, with smaller acreages devoted to ground nuts, linseed, sweet potatoes, edible canna, oats and crops for ensilage. The maize yield is expected to exceed that of last year, which averaged 9.06 bags per acre, while good average yields are expected from the other crops. The cattle have been added to during the year by importations of pedigreed Shorthorns from Great Britain, and the progeny of these, when old enough, will be sold to farmers. A consignment of Large Black and Large White pigs is expected shortly from England, and similarly the progeny of these, when available, will be offered for sale, and should have a marked influence on the pig population of the Colony.

The visitors manifested the greatest interest in the farm, and, fortified by the information given in the costings published in the issue of the *Rhodesia Agricultural Journal* for March, were able to dissect and analyse the different operations of the past year's work. As explained during the course of the day, it is not claimed that the system of costing adopted at Gwebi is perfect, and it will no doubt be improved upon as experience is gained. It is hoped that the costings at Gwebi will encourage farmers generally to adopt some such system, in a modified form, to their farming business.

A number of speeches were made during the day, notably one by the Honourable R. A. Fletcher. In the course of his remarks the Minister expressed appreciation of the attendance, and referred to the testimony given by Sir Daniel Hall, Sir Frederick Keeble and Mr. Christopher Turnor as to the excellent work being done at Gwebi and the experiment stations. He asked the farmers to put to practical use the information to be gained at these stations, and advocated closer contact with the technical officers of the Department. He considered that Gwebi is now entering on a sphere of usefulness, as a result of the policy adopted seven years ago to run the farm as a commercial proposition, and alluded to the



Farmers' day at Gwebi.
The sale of cattle.



Farmers' day at Gwebi.
Portion of the maize lands.

fact that, being a Government farm, a good deal of work had to be undertaken which would not be necessary on a privately-owned farm. The Minister considered that progress had been made with the dairy herd, and mentioned that for the first time the number of stock was sufficient to justify a sale being held on Farmers' Day instead of as part of the ordinary stock sales following the Salisbury Show, as has been the custom in the past. He alluded to the Sand Veld Research Station which is being started at Marandellas, and hoped that next year it would be possible to hold a Farmers' Day there to demonstrate the work in progress. In his concluding remarks, the Minister appealed to farmers to give the Government credit for good intentions, and to believe that they were doing the very best they could for the farming industry.

At the sale of Friesland cattle in the afternoon 19 animals were put up for auction, a total sum of £327 1s. 6d. being obtained for the 11 animals sold. The two young bulls, "Gwebi Britannia" and "Gwebi Monarch," realised 57 and 71 guineas respectively.

After the sale, short addresses were given by the Plant Pathologist on diplodia in maize, and by the Chief Chemist on the fertilising treatment of arable land for maize growing. These two officers and the Chief Agriculturist, who was called upon to discuss measures for combating witchweed and several other matters, were kept busy for some time replying to questions arising out of the lectures. The day concluded with remarks by the Acting Secretary of the Department of Agriculture, Dr. Brain, who congratulated the farm manager and staff on the excellent condition of the crops and stock, and expressed the wish that visitors had passed a pleasant and profitable day.

Branding of Cattle.—In the editorial notice which appeared in the March issue of the Journal the statement was made that slaughter cattle *en route* to a buyer or auction centre must be branded. According to the strict interpretation of the Brands Ordinance of 1900, this is correct, but in practice the branding of such cattle is not insisted upon. In

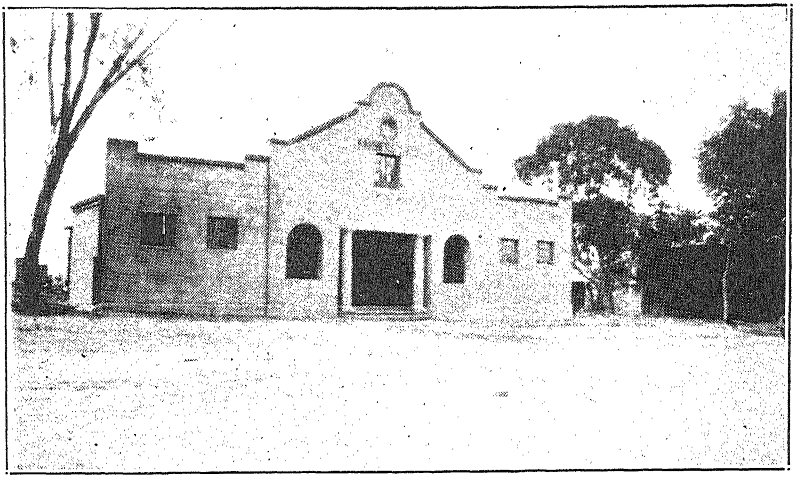
the editorial notice referred to, it was also stated that the branding regulations now permit an owner to brand his cattle anywhere on the near side, with the exception of the hoof. It appears to be necessary to amplify this by adding that, if desired, cattle can be branded on the near horn, a practice which is adopted by some owners.

During the present session of Parliament an amending Act has been passed providing for the branding of cattle intended for export. With such cattle a special brand has to be registered, consisting of three or a lesser number of letters or numerals, and this brand may be used throughout the Colony, in addition to any other brand registered under the Ordinance.

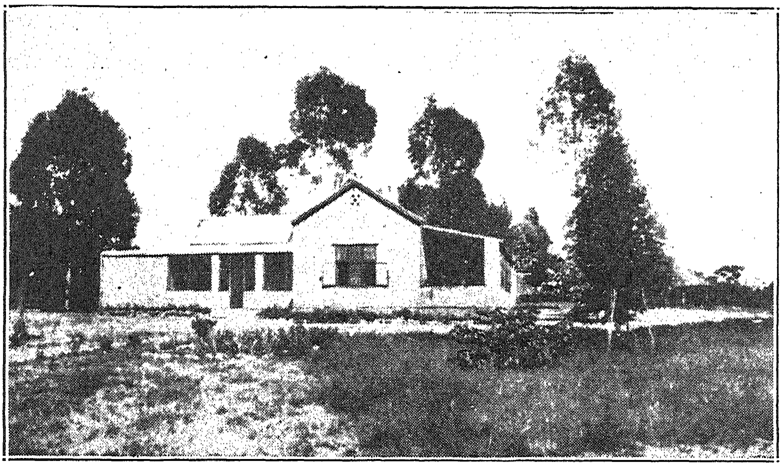
Bindura Farmers' Hall.—The illustration on the opposite page shows the Appleby Memorial Porch of the Farmers' Hall at Bindura. The porch is the main entrance to the building, and is in memory of Jack Appleby, son of Mr. J. Appleby, Benridge, Bindura, who died a few years ago. The memorial has two spacious rooms, and is a handsome addition to the hall. With the exception of the porch, which was paid for by Mr. Appleby, the whole of the main building was erected from funds contributed by the farmers of the district. Contributions in the early period took the form of bags of maize, some giving five bags and some others up to 20 bags; other farmers gave cash. It was the custom for members of the Farmers' Association annually to give what they could afford.

The hall was ready for occupation in 1915, but in 1925 a 14 ft. wide verandah was added to the west side, and in 1928 a room was built as part of the main building for the use of the Women's Institute.

The hall serves a variety of purposes, and is a great asset to the community at Bindura. It is a tangible example of co-operative effort, which we hope will encourage farmers in other parts of the Colony to adopt similar means of acquiring a hall of their own.



The Appleby Memorial porch of the Farmers' Hall at Bindura.



Homestead of Mr. D. Riley, Selwood, Bindura.

Apiculture.—That greater interest is being manifested in bee-keeping in this Colony is evidenced by the number of letters received by us asking for information on the subject. We regret that we have no literature available for issue, and can only refer enquirers to standard works on the subject and to articles which have appeared in the *Rhodesia Agricultural Journal.* Judging by the imports of honey into Southern Rhodesia—value £201 in 1928—and by the difficulty in procuring Rhodesian honey in the local stores, honey as an article of diet is but little used in this Colony. Yet as a food accessory it is wholesome, appetising and has a distinct medicinal value. The price of 2s. 9d. per lb. for Cape honey in Salisbury is, of course, against its general use, but it seems to us that local honey could be sold at a much lower price than this and return a fair profit to the bee-keeper. Excellent honey can be produced in this Colony, but at the present time we depend mainly upon importations for our limited supplies.

As we pointed out in the editorial note which appeared in the December issue of the Journal, bee-keeping is a very extensive industry in various countries of the world. We have not any recent figures of production, but in the United States of America seventy-five million dollars' worth of honey and three million dollars' worth of beeswax were produced in the year 1923. The exports of honey from New Zealand in 1925 were valued at £53,156 and in 1926 at £35,432. The production of honey in Australia in 1927-28 amounted to 5,928,436 lbs. and of beeswax to 78,908 lbs. In the Union of South Africa about 387,000 lbs. of honey were produced in 1921, and according to the Farmers' Handbook, on a conservative estimate about £2,000,000 worth of honey is lost to the Union of South Africa annually, due to the general neglect of the bee-keeping industry.

As we have already pointed out, Southern Rhodesia has many natural advantages in the matter of a genial climate, nectar producing flora and travelling swarms of bees to be had for the taking. The limiting factor, however, appears to be the difficulty in handling the Rhodesian bee, which has acquired a reputation for ferocity when annoyed. There is undoubtedly a great scope for investigation and research with a view to the breeding of a strain of bee which will make apiculture a safe and profitable undertaking.

Crop Production.—According to the "International Review of Agriculture," the area sown with maize in the Argentine this year is estimated at 13,643,000 acres, against 11,863,000 in 1928-29 and 9,921,000, the average of the preceding five years. It is stated that the weather conditions have been rather unfavourable to maize crops. The maize production of the United States of America in 1929 was 734,213,000 bags, in comparison with 789,292,000 bags in 1928 and 769,087,000 bags, the average for the five years 1923 to 1927. There would thus appear to be very little fear that exports from America will be of sufficient size to disturb the international market during the present year. Visible stocks in the United States of America early in February were 4,808,000 bags, in comparison with 7,830,000 and 10,495,000 bags on the same date in 1929 and 1928 respectively. These figures are, however, only of limited significance, and according to an official appreciation of the position it is doubtful if considerable importations will be necessary. Imports, if any, will be obtained mainly from Argentina.

In the Union of South Africa the maize area for the year 1929-30 is 6,568,000 acres, compared with 5,516,000 in 1928-29 and 4,600,000, the average for the period 1923-24 to 1927-28. The preliminary estimate of the new crop is 25,363,000 bags, of which about 13,000,000 bags should be available for export.

In Kenya the area sown with maize in 1929 was 246,000 acres, compared with 205,000 in 1928 and 150,000, the average of the preceding five years. Production amounted to 2,007,000 bags. The estimated area under maize in Southern Rhodesia for the season 1929-30 is 340,000 acres and the yield expected is about 17,000,000 bags.

At the beginning of January this year the United States Federal Farms Board reported that last year's cotton acreage was too large and constituted the largest planted acreage on record except in 1925 and 1926. The national cotton sales agency of the American Cotton Co-operative Association has appointed a cotton acreage reduction association and it will be attempted to reduce the cotton acreage from the 46 million acres planted for the 1929 crop to 40 million acres for the 1930 crop. According to the Bureau of the Census, the

amount of cotton ginned up to 16th January, 1930, was 14,188,000 bales, compared with 13,889,000 bales for the same period of last season.

Land and Agricultural Bank of Southern Rhodesia.—The number of applications for loans received during the year 1929 was 358 for advances aggregating £234,988, as compared with 443 applications for £321,072 in 1928 and 410 for £357,143 in 1927. Sixty-nine bonds were cancelled during the year, representing a capital sum of £63,037. The number of ordinary mortgage bonds registered during the year was 173 for advances aggregating £138,064, compared with 182 for £158,135 in 1928 and 199 for £197,240 in 1927.

The Board of the Bank (*vide* the annual report) consider that the falling off during the year of new settlers, and the natural curtailment of farming enterprises owing to the unsatisfactory position of tobacco, probably account partly for the reduction in the number of applications, while the restricted funds available to the Board for investment contribute to the increased number of applications rejected. It is recognised that the past two or three years have imposed a severe test upon farmers, from which those who have been able readily to adapt their operations to quickly varying conditions and hold a tight rein over the natural desire to embark upon schemes involving undue capital expenditure have come out best. The Board considers that the applicability of the motto *Festina lente* to farming in a young country has been emphatically demonstrated. The warning given in 1927 for the necessity of applying strict business principles to any proposition for the development of the farm is reiterated. Thus, "before deliberately planning to incur a liability which it may not be possible to meet from revenue, the farmer would do well to provide for such an emergency before committing himself, rather than to rely upon being able, with the Bank's help, to extricate himself from his financial difficulties afterwards." All of which is sound advice. The following extract from the report is also well worthy of note: "In the process of adapting himself to new conditions the farmer is necessarily

ERRATUM

In the Editorial on "Crop Production," p. 462, line 10 from bottom of page, "17,000,000 bags" should read "1,700,000 bags."

faced with the need for some measure of capital expenditure. This, in given circumstances, may sometimes be facilitated by groups of farmers combining for concerted action under some co-operative scheme. Different districts will evolve different policies in regard to the extension of their operations and entry into new spheres of farming enterprise. The project on these lines, launched by certain farmers in the maize-growing districts of Mashonaland, for buying cattle from the ranchers for fattening for market, will be watched with interest and will receive all possible assistance from the Bank."

Foreign Tobacco Production in 1929.—The American trade journal, *Tobacco*, gives some interesting figures relative to the production of tobacco in 1929. It is stated that Canada, although the flue-cured acreage in the tobacco sections of Ontario showed an increase of about 40 per cent. over the previous year in the face of a general reduction of the area planted to tobacco in that country, is on an import basis for tobacco of that type relying on the United States for the greater part of her requirements. American exports of flue-cured tobacco to Canada have been remarkably stable since 1925, regardless of the fluctuations in the Canadian crop. The flue-cured crop of Ontario in 1929 amounted to 9,000,000 lbs., while the exports of flue-cured leaf from the States to Canada amounted to 12,808,000 lbs. in the same year.

The Japanese production of flue-cured tobacco from American seed was the same in 1929 as in 1928, or approximately 16,000,000 lbs., compared with 13,000,000 lbs. in 1927. An extension of the tobacco area from 9,800 acres in 1929 to 10,800 in 1930 is planned by the Government tobacco monoply. The Chinese 1929 production of flue-cured tobacco is estimated at about 37,000,000 lbs., or slightly over that of 1928. The size of the native flue-cured crop does not exert an appreciable effect on the Chinese takings of American flue-cured leaf, due to the limited extent to which the native leaf can be substituted for the American, from which it differs in quality.

The aggregate production of Bulgaria, Greece, Turkey and Yugoslavia, all of which produce and export so-called "Oriental" types of tobacco, which are used largely in the European and American cigarette industries, increased from approximately 260,000,000 lbs. in 1928 (the lowest point since the post-war peak in 1924) to 340,000,000 lbs. in 1929, which is 10,000,000 lbs. below 1927 production. No information is as yet available on the Russian production of "Oriental" or "yellow leaf" tobacco, which amounted approximately to 66,000,000 lbs. in 1928 and 91,000,000 lbs. in 1927. The United States is, on an import basis for these types of tobacco, purchasing largely from Turkey and Greece for use in blending with American cigarette types.

As regards dark tobacco, it is stated that although quantitative data for countries producing tobaccos similar to or competing with American fire-cured and air-cured types are for the most part not available, indications are that the aggregate production in 1929 was probably below the preceding year. It is stated that reduced production in the countries of the British Empire, Algeria and France seems likely to more than offset increased production in Italy and Hungary.

Reports of the International Institute of Agriculture at Rome indicate a production in Italy of 97,000,000 lbs., which is 21 per cent. above 1928 and almost equal to the record crop of 1926.

British imports of American tobacco increased in 1929, and constituted a larger portion of the total tobacco imports than in 1928 and 1927. The quantity of American tobacco imported and the percentages of the total imports are as follows:—177,442,000 lbs. or 79.8 per cent. of the total in 1927; 171,839,000 lbs. or 78.9 per cent. of the total in 1928, and 205,280,000 lbs. or 85.6 per cent. of the total in 1929. This increase in quantity imported was accompanied by a decline in the value per pound from 37 cents in 1928 to 35 cents in 1929.

Native Agriculture in Southern Rhodesia.—The report of the Agriculturist, Native Development Department, for the year 1929, on the agricultural demonstration work in

native reserves, states that during the season 1928-29 the average yield on 196 demonstration plots was 10.9 bags per acre, while native lands adjacent yielded an average of 1.9 bags per acre. In addition to this demonstration plot work, demonstrators made 417 visits to native farmers, gave 392 lectures on farming subjects, castrated 1,074 head of scrub stock, including 1,017 bulls, 13 donkeys and 44 goats, and had 341 native farmers co-operating in better methods on their own lands.

It is stated that the agricultural policy of the Department is the centralisation of lands, which is considered to be the only method of combating successfully the wasteful and extravagant farming practice commonly known as "kaffir farming." With native farmers moving from place to place, cultivating new lands as fast as the old lands become exhausted and destroying grazing for cattle, the natural resources of native reserves are rapidly being destroyed. The purpose of the Department is to teach the reserve natives to make the most of their arable and grazing lands—to grow the quantity of crops they require on one acre instead of growing it on ten acres, and thus set free larger areas for grazing purposes. Instead of ploughing up lands all over the reserves and exhausting their fertility by wasteful farming practices, the native is being taught by the demonstrators to conserve fertility through practical crop rotation on permanent lands.

We learn from the report that demonstrators are now demonstrating in eighteen different native reserves on 205 plots, totalling 229 acres. Inspection of these plots by the Agriculturist has convinced him that work is done better than before and that more interest and enthusiasm are being shown by the plot-owners. It is stated that Native Commissioners throughout the Colony are co-operating with the demonstrators by supplying them with instruments for the castration of stock, and are urging the natives to do away with all scrub bulls. Meanwhile they are supplying them with better grade bulls to take the place of the scrubs. It is further stated that there has been a marked improvement in the cattle on all reserves since the demonstrators' work began. Winter ploughing, the application of kraal manure

and better tillage and planting are now features of native agriculture.

The Agriculturist considers that the outlook for the demonstration work is bright. He mentions that there are now three classes of carefully selected candidates in training at Domboshawa School, and the Department is able to plan the work for three years in advance.

Apropos of the work reviewed above, it is interesting to note that the Chief Native Commissioner in his annual report for the year 1929 states that there have been comparative failures which have been more than compensated by marked successes in Chibi, Makoni and Bubi districts. He quotes the Native Commissioner, Bubi, as remarking (on demonstrations in Ntabazinduna Reserve), "The season was a favourable one, and the demonstrator took full advantage of it. Some of his experimental plots yielded over twenty bags of maize to the acre. The natives took a keen interest in his work, and several of them manured and winter-ploughed their lands, with the result that crops in this area have improved wonderfully."

In subsequent remarks the Chief Native Commissioner states that there is a well-directed enthusiasm among the best of the native demonstrators which promises good results. Some reserves in Matabeleland, he finds, are overcrowded or semi-arid, or both, and in their case (Ntabazinduna being an instance) intensive cultivation has become a necessity. He refers to the Gwanda Reserve demonstrator, who produced on his experimental plot twenty-five bags to the acre, as compared with three bags in the vicinity. As a result, heavier ploughs and cultivators are in demand, and manuring is in favour. The Chief Native Commissioner goes on to state that the improvement is observed to be only in the vicinity of the plot and to have had no far-reaching effects. He interpolates two observations: firstly, that a native land under pristine methods produces other crops side by side with cereals on the same plot, which makes the demonstrative contrast less striking; and, secondly, that experimental plots, independently of native-owned lands, mark a divergence from the demonstration scheme as originally conceived. He adds, "they may or may not prove ultimately successful."

Agricultural Experiment Station, Salisbury.

ANNUAL REPORT OF EXPERIMENTS, SEASON 1928-29.

By H. C. Arnold, Manager.

(Published with the Authority of the Chief Agriculturist.)

PART I.

During the season under review the rainfall was fairly evenly distributed throughout the season, which may be considered to have been a favourable one on the whole. The total rainfall was 31.62 inches, which is about half an inch less than the mean annual precipitation.

Analysis of Rainfall, Season 1928-29.

Month	Number of rain days	Total for month in inches	Number of rains over ¼ in.	Total to end of month	Periods exceeding one week without rain
October	2	.33	...	.33	Nov. 11 to 21
November	9	3.48	5	3.81	Nil
December	15	5.45	6	9.26	"
January	18	11.52	13	20.78	"
February	8	4.40	4	25.18	"
March	18	6.30	8	31.48	March 22 to April 5
April	2	.14	...	31.62	
	72	31.62	36		2 periods of 7 days or over

During the latter part of the season the crops suffered somewhat through lack of rain, as the showers which occurred after 16th March were very light, and for the most part ineffective.

This report is drawn up on similar lines to those of previous years, and provides a summary of results of the more important experiments in progress.

With the exception of those in the crop rotations, all experiments are usually duplicated, but in many instances, particularly those in which small differences are only likely to occur, the various treatments are replicated several times.

Having served their purpose, certain experiments which have been in progress for a number of years have been discontinued, namely—

1. Maize: check-rowed *versus* drilled.
2. Gram or chick-pea variety trials.
3. Niger seed and various legumes for silage.
4. Ratooned cotton.

Several of the varieties of ground nuts, dolichos beans, velvet beans, potatoes and sweet potatoes, which after trial over a period of four to five years have been proved less productive than other kinds, have been discarded, and further experiments with these crops include only the varieties which appear to possess greater merit and those new introductions which have not yet been fully tested.

New experiments commenced this year are designed to investigate the following problems:—

1. The effect on the maize yield of applying fertiliser to the green manure crop, which is to be followed by maize, compared with applying the fertiliser direct to the maize crop, following an unfertilised green manure crop.

2. The relative merits of four different methods of applying fertiliser to maize land, namely: (a) broadcast on surface and ploughed in; (b) broadcast on surface and harrowed in a few days before planting the seed; (c) applied in drills at time of planting; (d) applied in the holes with the seed at time of planting in check-rows.

3. Mixed sowings of legumes and non-legumes for green manure *versus* the same legumes or non-legumes sown separately for that purpose.

4. Maize following fertilised tobacco sown on the unploughed ridges at the places previously occupied by the tobacco plants *versus* sowing in the usual way after the land

5. Methods of cultivating the growing maize crop: (a) the usual thorough cultivation; (b) removing the weeds by hand or hoes, while disturbing the surface of the soil as little as possible; (c) no cultivation whatever.

6. An extension of the liming trials already in progress.

Crop Rotation Experiments. First Series, 1913-29.

Maize Yields in Bags per Acre.

System of cropping	1928-9 rainfall 31.62	1927-8 rainfall 26.63	1926-7 rainfall 22.39	1925-6 rainfall 33.08	1924-5 rainfall 52.28	1923-4 rainfall 16.32	Average yields
*A. Maize continuous, 16th year	6.2	1.9	5.25	7.8	2.3	4.2	5.94 (15 yrs.)
B. Alternate maize and bare summer fallow —no manure, no fertiliser ..	5.65	8 15	10.2	16.3	2.05	12 8	10.89 (14 yrs.)
C. Three-course rotation— maize, velvet beans (reaped). oats. No manure or fertiliser ..	12.0	12.15	16.9	15.5	19.45	12.5	15.22 (13 yrs.)
D. Four-course rotation— maize (+6 tons dung per acre) oats, velvet beans (reaped). maize. Average of two maize plots	19.0	17.45	22.45	24 8	22.9	11.3	19.0 (12 yrs.)

* Having grown maize for 15 years in succession without manure or fertiliser, during which time its yields had gradually decreased until they had become so low as under practical field conditions to have rendered them negligible, this plot had served its purpose. With the object of comparing two methods of again raising the cropping power of such land to a more profitable standard the whole plot was treated with a mixture of one-third bone meal and two-thirds superphosphate, at the rate of 250 lbs. per acre, at the beginning of this season. One half was then planted to maize, while the other half was sown to a mixture of Sunn hemp and velvet beans

Plate I.

Maize and Sunn hemp on the plot in the rotation trials which had previously grown maize for 15 years in succession. The last maize crop yielded 1.9 bags per acre. This season the whole plot was dressed with 250 lbs. per acre of bone and superphosphate, and one half was sown to maize, and the other to Sunn hemp and velvet beans for green manure. The maize yield was 6.2 bags per acre.

The portion of the plot planted to maize yielded 6.2 bags per acre, and as the yields in systems "B" and "C" are somewhat lower than those of previous years, it is reasonable to assume that in the absence of the fertiliser the yield of "A" would have been less than two bags per acre, and that the increase over that amount was due to the action of the fertiliser. Plate No. 1 shows the maize and the legume crops at the place where they meet on their respective halves of the plot. It will be seen that the legumes were much more vigorous than the maize. This is probably due to the fact that they were able to obtain the nitrogen they required from the air through the bacteria on their roots. The maize appears to have suffered through the inadequacy of the supply of nitrogen, for which reason it was probably unable to make the fullest use of the phosphates supplied in the fertiliser.

The yields on the other plots follow the same trend as those of previous years, and afford very striking testimony of the value of judicious crop rotations in which crops having different habits of growth, and whose demands on the plant foods in the soil are dissimilar, follow one another.

CROP ROTATION EXPERIMENTS.

Second Series.

These rotations were commenced in 1919-20, when maize was the only crop being grown for overseas markets, and were designed to meet the needs of farmers who could not follow a system of mixed farming. The series includes two plots, A and G, on which maize has been grown continuously for ten years without manure or fertiliser to check the results of the rotation trials.

Plot A. System "E."

Maize Continuous, without Manure or Fertiliser.

Seasons and Yields of Maize in Bags per Acre.

1928-29	1927-28	1926-27	1925-26	1920-21	1919-20	Average over 10 years
7.65	6.5	10.6	12.0	27.2	25.5	12.65

Plots B to E. System "F."

Three-quarters of the land under maize, one-quarter under Sudan grass. Each year one section under maize, commencing with Plot B in 1919-20, receives eight tons of farm manure per acre.

Maize Yields in Bags per Acre.

	1928-29	1927-28	1926-27	1925-26	1919-20	Average 1920-29 (8 crops)
Plot B ...	14.55	17.00 †	18.15	S.	26.0 †	19.34
„ C ...	10.15 †	8.5	S.	21.5	23.	15.64
„ D ...	9.55	S.	16.35	24.5 †	S.	18.31
„ E ...	S.	11.60	20.30 †	18.9	24.6	17.13
Average ...	11.42	12.36	18.27	21.6	24.7	17.60

† Indicates application of farm manure.

If the yields given in this tabulation are compared with those from Plot A, it will be seen that much larger crops have been obtained from these plots, although the eight tons per acre dressing of farm manure, once every four years, has not been sufficient to maintain the fertility of the land at its original level.

Plot F. System "G."

Maize Continuous, no Manure or Fertiliser.

Seasons and Yields of Maize in Bags per Acre.

1928-29	1927-28	1926-27	1925-26	1920-21	1919-20	Average over 9 years
6.1	4.8	9.63	14.0	24.2	23.3	12.3

A slightly better yield was obtained this year on both of the maize continuous plots in this series, as compared with 1927-28. This was probably due to the more even distribution of the rainfall, and hence a more favourable season for the maize crop.

Plots G to K. System "H."

Three-quarters of the land under maize, one-quarter under velvet beans, which are ploughed under for green manure. One section each year under maize, commencing with Plot G in 1919-20, receives 200 lbs. per acre of bone and superphosphate, *i.e.*, each field receives fertiliser once every fourth year, and once in every four years is green manured.

	1928-29	1927-28	1926 27	1925-26	1919-20	Average 1919-29 (8 crops)
Plot G ...	8.75	14.50 †	17.90	Beans	23.1 †	15.90
,, H ...	9.00 †	14.40	Beans	13.8	23.0	16.17
,, J ...	17.50	Beans	14.20	15.8 †	Beans	17.42
,, K ...	Beans	7.80	14.70 †	20.2	19.2	15.30
Average ...	11.75	12.23	15.60	16.6	21.7	16.19

† Indicates application of fertiliser.

In this rotation, during the last two or three seasons, the effect of ploughing under a crop of velvet beans has been very pronounced, while the benefit resulting from the fertiliser treatment has been smaller than was the case in earlier years. This may indicate either that the humus or the nitrogen content of the soil is now the limiting factor in this rotation, and suggests that it might be more profitable to apply the fertiliser to the crop of maize which immediately precedes the green manure crop, in order that the latter may secure a larger proportion of the residue of the fertiliser and make a more luxuriant growth for ploughing in. Alternatively a deficiency of potash may be a primary or secondary cause of the smaller response to phosphatic fertiliser.

The average yields of maize obtained in the two rotational systems "F" and "H" are seen to be about equal, and on this class of soil, for maize production, the effect of a dressing of eight tons of farm manure at four-yearly intervals is about the same as that of a crop of velvet beans ploughed under, plus

one application of 200 lbs. of phosphatic fertiliser during the same period. It must be remembered, however, that in system "F" a crop of one to one and a half tons of Sudan grass hay is obtained in addition to the maize, so that four crops are taken off the land during each period of four years, as against three crops in system "G." The eight tons per acre of farm manure have therefore had a somewhat greater beneficial effect than the dressing of 200 lbs. of bone and superphosphate supplemented by a green manure crop every fourth year.

GREEN MANURING WITH IMMATURE *VERSUS* MATURE CROPS.

These experiments were commenced with the object of ascertaining whether an immature green manure crop would have the same beneficial effect on land as that of a mature crop, when ploughed under. In this case the crop is considered to be "mature" for green manuring purposes when it has attained its maximum growth. With most of the crops used for green manuring here, this stage will not have been reached until part of the seed crop has become fully formed, but it will be some months before the crop has reached maturity in the sense that it is ready to harvest for seed purposes.

The results of previous experiments on these lines have indicated an appreciable difference in favour of the "mature" green manure crops, and this year's trials corroborate those results. In one series of four plots Sunn hemp was used, and in the other series velvet and dolichos beans were sown together. The average amounts of green material ploughed under in each case were as follows:—

	Date immature crop ploughed under	Green material, lbs. per acre	Date mature crop ploughed under	Green material, lbs. per acre
Sunn hemp	15.1.28	3,200	28.2.28	12,550
Velvet beans	9.2.28	7,743	28.3.28	15,000

The average yields of maize reaped from each pair of plots during the season under review were as shown in the following table:—

Yield of Maize in Bags per Acre.

	Immature crops	Mature crops	Difference in favour of mature crops
Sunn hemp	14.27	16.69	+ 2.22
Beans	14.97	17.25	+ 2.28

The bulk of vegetable matter ploughed under and the percentage of dry matter in the crop are no doubt matters of prime importance, and these returns indicate that the stage of maturity of the green crop may account for a difference of as much as two bags of maize per acre in the yield obtained.

The need to sow the green manure crops as early as possible in order that they may become sufficiently mature to make the maximum growth and to allow of their being ploughed under while the moisture in the soil is sufficient to cause rapid decomposition of the vegetable matter is often overlooked by farmers.

MAIZE DISTANCE-PLANTING TRIALS.

Yields of Maize in Bags per Acre.

Distance of planting.	Number of plants per acre.	1928-29 rainfall, 31.62 inches.	1927-28 rainfall, 26.63 inches.	1926-27 rainfall, 22.39 inches.	1925-26 rainfall, 33.08 inches.	1924-25 rainfall, 52.28 inches.	Average over 5 years.
in. in.							
24 x 15	17,424	13.76	12.28	17.00	12.4	23.1	15.41
24 x 18	14,520	13.52	15.50	17.36	14.2	19.7	16.22
30 x 15	13,939	13 76	15.00	19.53	17.5	23.1	17.47
30 x 18	11,616	14.12	16.24	19.13	18.2	20.4	17.55
36 x 15	11,616	16.64	16.16	18.24	18.5	20.1	17.30
36 x 18	9,680	16.74	17.08	18.69	17.5	20.3	17.9
40 x 15	10,454	16.40	15.44	16.68	16.6	17.0	16.37
40 x 18	8,712	17.20	15.60	16.56	16.2	17.2	16.49

The yields obtained this year support the results of previous seasons' trials, which indicate that the highest yields are obtained when the rows are spaced about 36 inches apart and the plants stand at about 18 inches apart in the row. Readers should bear in mind, however, that in these experimental plots practically a hundred per cent. stand is obtained, so that under field conditions it may be advisable to drill the seed rather closer than this to allow for losses through the numerous causes which combine to reduce the stand. It will be seen also that the yields from the plots on which the rows are 40 inches apart are nearly as high as those on the plots sown at 36 inches. In view of the fact that by spacing the rows at 40 inches apart an appreciably larger area can be drilled in a given time than when the rows are spaced at 36 inches, where large acreages have to be sown in a limited time, and on weed-infested land, it may be found more economical to plant the maize at 40 inches between the rows and the seed at 12 inches to 15 inches apart in the row, and thus make allowance for a reduction of the stand through insect pests, harrowing and other causes.

MAIZE VARIETY TRIALS.

Reports which are received from other countries and published in the Press of the enormous yields of maize obtained often engender the belief among farmers that if the varieties which produced those phenomenal yields could be imported into this Colony, our local returns might be considerably increased. Since the commencement of experimental work at this station many new varieties have been introduced and tried out, but in no instance have the new kinds proved superior to our standard varieties. The present series of maize trials have been conducted over a period of eleven years, and while failing to show any significant difference in the yielding powers of our standard breeds, they have established the superiority of these over all the more recently introduced kinds.

Yields of Shelled Grain in Bags per Acre.

	Previous averages	1928-9	1927-8	1926-7	1925-6	1924-5	Average
Salisbury White	13.1 (6 years)	12.36	18.96	18.12	17.2	16.5	14.70 (11 years)
Potchefstroom Pearl	13.1 (6 years)	14.91	19.20	17.28	17.1	16.5	14.87 (11 years)
Louisiana Hickory	13.0 (4 years)	12.90	19.14	14.03	15.6	18.8	14.72 (9 years)
Hickory King	12.5	13.44	17.40	17.97	11.6	19.5	14.10 (11 years)
American White Flint	...	8.40	14.00	10.20	15.3	...	11.98 (4 years)
Cooke's Prolific	...	10.34	14.16	12.81	...	...	12.44 (3 years)

The variety named Cooke's Prolific is one of those which have produced very heavy yields in America, hence its introduction and trial here. It is found that, although nearly every stalk bears two or more ears, owing to their small size the acre yield is less than that of our single-eared breeds. The American White Flint variety has yielded much better than other flints which have been tested here, and although it cannot be recommended for general cultivation in Mashonaland, it may be found a profitable variety in districts which through lack of rain or early frosts require a variety which is drought resistant and early maturing.

THE RELATIVE VALUE OF CROPS FOR GREEN MANURE.

The practice of ploughing under crops for green manure is becoming more popular each year, and the question of the most suitable crop for this purpose is often raised. With a view to obtaining information on such an important matter this series of experiments was commenced some ten years ago. It is generally accepted that the leguminous crops are to be preferred because of their ability to use the free nitrogen of the air for their requirements, so that when they are ploughed in, a good deal of this nitrogen is added to the soil and becomes available for use by the following crops. In some instances, particularly those in which the addition of nitrogen is not desired, a non-leguminous plant may be preferred, and in such cases the sunflower, or Niger seed (*Guizotea oleifera*), will usually be found suitable for the purpose.

The best legumes for green manuring in this Colony are Sunn hemp, velvet beans and dolichos beans. Sunn hemp has become deservedly popular during the last few years, chiefly because of its hardiness and suitability to a wide range of soils, its ability to smother weeds and the ease with which it can be ploughed under.

Yields of Maize in Bags per Acre.

Kind of green manure crop	1st series: average of two crops, 1925-27	2nd series: average of three crops, 1926-29	3rd series: one crop, 1927-28	4th series: first crop, 1928-29	Average of seven crops
Velvet bean	15.26	18.89	12.34	17.28	16.69
Dolichos bean	13.80	17.77	18.40	18.20	16.79
Sunn hemp	16.78	17.91	14.96	16.44	16.96
Niger seed	...	17.04	...	...	...
Sunflower	...	...	...	15.00	...

The returns recorded this season support those of previous years and indicate that all three legumes on this station give equally beneficial results when used for green manure. The question of which is the best for any particular farm must be decided after consideration of its suitability to local conditions and of other characteristics, such as cost of seed per acre, power to smother weeds, rapidity of growth, ease of ploughing under and so forth. The returns show that the leguminous crops have given slightly better returns than the non-legumes. In the second series the average total yield of maize after the legumes, over the three-year period, is 3.46 bags per acre more than that after Niger seed. In the fourth series the first year's return from the sunflower is 2.3 bags less an acre than that from the legumes.

These returns indicate that although the cost of seed of non-legumes may be considerably less than that of the legumes, the latter will probably be the more profitable to use in the long run.

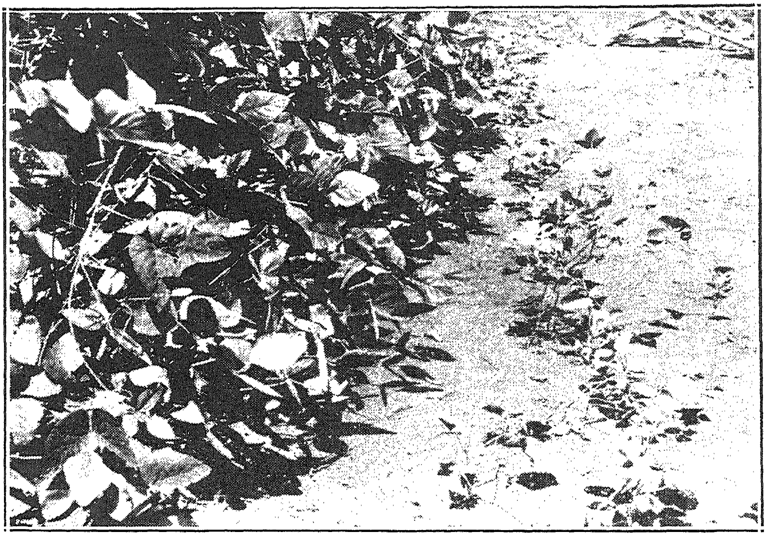


Plate II.

On the left are velvet beans and Sunn hemp, which received 250 lbs. per acre of bone and superphosphate. On the right is a row of dwarfed beans, which received no fertiliser.
Agricultural Experiment Station, Salisbury.

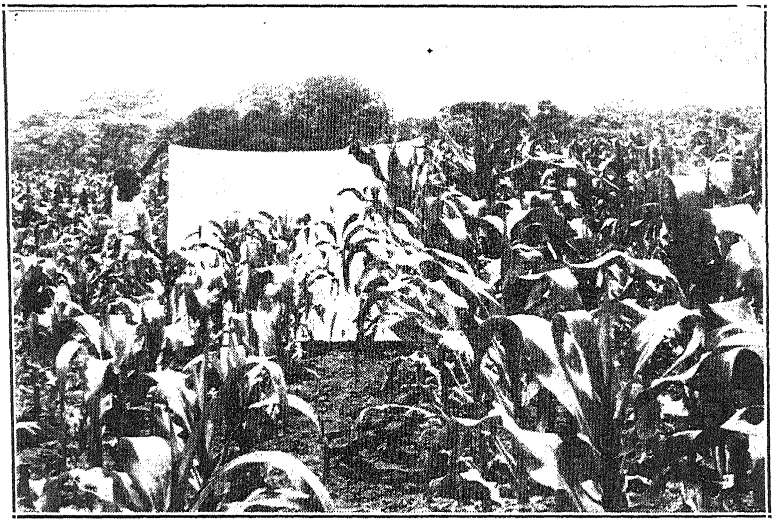


Plate III.

Maize on the left following two immature crops of Sunn hemp ploughed under. Maize on the right following one mature crop ploughed in.
Agricultural Experiment Station, Salisbury.

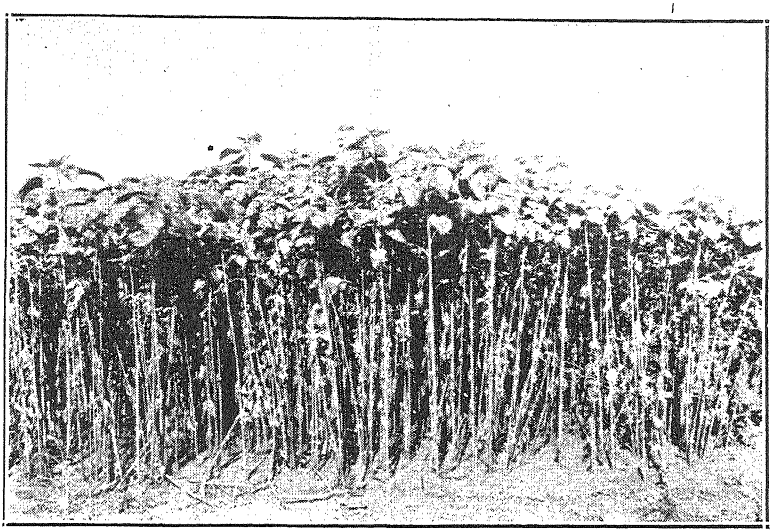


Plate IV.
A thick stand of sunflowers for green manure. Rate of seeding 45 lbs. per acre, broadcasted.
Agricultural Experiment Station, Salisbury.

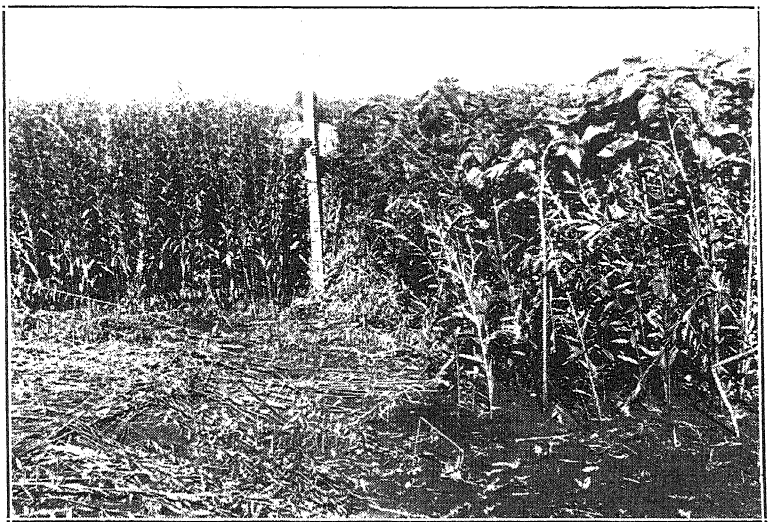


Plate V.
On the right sunflowers and Sunn hemp for green manure. Both grew quickly and in other respects combine well for this purpose.
Agricultural Experiment Station, Salisbury.

The question is often raised as to whether it is more economical to plough a crop under, when as an alternative it could be harvested for seed hay or ensilage.

In the second series of these trials the plots were divided and a half of each plot was reaped for seed, the roots and short stubble being left to plough in. The average yields of duplicate plots over a period of three years are tabulated below.

Yields of Maize in Bags per Acre.

Season	Green manure crop							
	Velvet bean		Sunn hemp		Dolichos bean		Niger oil	
	Ploughed under	Reaped	Ploughed under	Reaped	Ploughed under	Reaped	Ploughed under	Reaped
1926-27	23.08	20.52	21.52	20.96	22.44	20.40	20.88	18.56
1927-28	19.84	16.40	19.20	16.88	19.08	16.16	18.08	14.56
1928-29	13.76	11.32	13.02	12.20	11.80	10.64	12.16	10.92
Total for 3 yrs.	56.68	48.24	53.74	50.04	53.32	47.20	51.12	44.04
Difference in favour of ploughing whole crop under	8.44		3.70		6.12		7.08	
Average 6.35								

These returns show that over a period of three years an average increase of 6.35 bags of maize has resulted from ploughing the whole of the plant under, as against ploughing only the roots under. In the case of the velvet and dolichos beans the equivalent of two tons of hay was ploughed in, so it appears that that amount of dry vegetable matter has increased the yield by six to seven bags of maize.

The fact that the difference between reaping and ploughing in is less marked in the case of Sunn hemp than in that of the velvet and dolichos beans is probably due to the

thickness with which the former crop is sown as compared with the latter, and the consequently much greater amount of roots and stubble in the land on which the Sunn hemp is grown. This crop is sown broadcast at the rate of 40-45 lbs. an acre, and there should be one plant to every 3-4 square inches of the land. The bean crops on the other hand are drilled in rows about 30 inches apart, with 12-15 inches between each plant in the row.

Owners of live stock may often find it more profitable to use their leguminous crops for hay or silage, but when this is done the fertility of the land must be maintained by returning the farm manure to the fields.

FERTILISER TRIALS.

At the request of the Maize Association a series of trials were commenced during the season under review, with the object of determining whether it is more profitable to apply fertiliser to a green manure crop which is to be followed by maize, or to apply the fertiliser direct to the maize crop after ploughing under an unfertilised green manure crop. Advocates of the former method assume that a considerably larger quantity of vegetable matter will be available for ploughing under if the fertiliser is applied to the green manure crop, and that because of this additional humus and possibly nitrogen the following maize crop will be increased more than if the fertiliser is withheld for application direct to the maize.

The plots on which these experiments are being carried out had previously been used for fertiliser trials and cropped to maize. Some of these plots were of average fertility after having received moderate dressings of fertiliser, but the crop-producing power of other plots had been much reduced by constant cropping without the addition of manure of any kind. Thus the two methods of applying fertiliser are being tried out on land of moderate fertility as well as on the land of low fertility. In the following table are given the total yields for two seasons previous to the commencement of these trials, and the tonnage of green manure ploughed under during the season under review. On the plots which received fertiliser it was applied at the rate of 200 lbs. per acre. On half of these plots raw phosphate rock was used and on the other half a mixture of one-third bone meal and two-thirds superphosphate was applied.

Total Yields of Maize in Bags per Acre.

Over two Seasons.

Number of plot	Before treatment commenced, 1926-28	Fertiliser treatment, 1928-29.	Weight of green material ploughed under, 1928-29 Tons per acre
5a1	14.32	Nil	15.05
5a2	18.32	Nil	14.30
5b1	3.72	Rock phos.	13.40
5b2	16.52	Bone and super.	15.75
6a1	15.16	Bone and super.	15.25
6a2	13.96	Rock phos.	19.50
6b1	5.44	Nil	9.35
6b2	19.52	Nil	18.65
7a1	8.96	Farm manure + bone and super.	23.35
7a2	19.48	Farm manure + rock phos.	22.00
7b1	2.68	Farm manure only	18.40
7b2	14.88	Farm manure only	24.40
8a1	22.20	Bone and super.	15.50
8a2	10.08	Rock phos.	16.25
8b1	19.40	Nil	13.75
8b2	17.32	Nil	17.80
10a1	30.00	Nil	16.52
10a2	16.20	Nil	14.60
10b1	20.08	Bone and super.	15.75
10b2	23.20	Rock phos.	23.15

The average total yield of maize during the two years previous to the commencement of these trials was 15.8 bags per acre for the plots on which the fertiliser is to be applied direct to the maize, and 15.34 bags for the plots on which the fertiliser was applied to the green manure crop. The average increase of green material for ploughing under was slightly more than one and a half tons per acre in favour of the fertilised plots, but the influence of the fertiliser was much greater on the plots of low fertility than on those which were moderately fertile at the commencement of the experiment. The planting of all these plots to maize commences in the season 1929-30.

METHOD OF APPLICATION OF FERTILISER TRIALS.

These investigations were also undertaken at the request of the Maize Association, with the object of finding whether the manner in which fertiliser is applied will affect the yield of the maize crop.

Fertilisers were applied in four different ways, namely—

(1) Broadcast during winter and ploughed in.

(2) Broadcast shortly before planting time and harrowed in.

(3) In drills at the time of sowing the seed.

(4) In holes with the seed at the time of planting by hand in check rows.

The fertiliser was applied at the rate of 200 lbs. per acre and was composed of one-third bone meal and two-thirds superphosphate.

The experiment was conducted on five blocks of randomised plots, each one-twelfth acre in extent, and the yields in pounds per plot were as shown in the following table:—

Block Number	Fertiliser ploughed in	Fertiliser harrowed in	Fertiliser in drills	Fertiliser in holes
1	125	136	105	128
2	141	180	152	171
3	130	113	124	127
4	177	128	166	182
5	275	205	262	245
Average of five plots	169.6	152.4	161.8	170.6

Statistical tests show that the "standard error" of this experiment is 20.3, and as the differences between the average yields are smaller than that amount, they cannot be attributed to the method of applying the fertiliser. It appears, therefore, that under the favourable weather conditions experienced last season all the various methods of application were equally

effective. In droughty seasons or during those in which the rainfall is unusually heavy, one or other of the methods may prove superior, and the experiments are being continued with a view to obtaining further information on these aspects of the problem.

MAIZE FOR SILAGE: DISTANCE PLANTING TRIALS.

These trials have been conducted over a period of eight years. Until this season the distance between the rows has been uniform on all the plots, while the distance between the plants in the rows has varied from 9 inches to 18 inches. The average of nine to ten tons per acre of green fodder has been obtained from these plots, the amount varying little, whether the plants were spaced closely or further apart in the rows. At the wider spacing of 18 inches the stalks grew too coarse and fibrous to make good silage, and it was found that the best fodder was produced when the maize stood 9 to 12 inches apart in the row. This experiment has now been re-arranged, and in future the distance between the rows will be 24 inches, 30 inches, 36 inches and 40 inches, and the plants in the rows will be 9 inches and 12 inches apart in their respective series. The results of the first-year trials after the re-arrangement of the experiment are as follows:—

Yields of Green Fodder in Tons per Acre.

Distance in the row	Distance between rows			
	24 ins.	30 ins.	36 ins.	40 ins.
12 ins.	19.06	19.15	13.88	14.73
9 ins.	15.89	15.78	12.85	12.19

These returns indicate that higher yields of fodder may be obtained if the rows are somewhat closer together than is usually practised when the crop is grown for grain. The lower yields recorded for the series sown at 9 inches apart are due to the soil being less fertile on the area on which those plots were situated.

(To be concluded.)

Reinforced Concrete Water Tanks.

By R. Hamilton Roberts, B.Sc. (Eng.), Assistant Irrigation Engineer.

It is proposed in this article to discuss and compare several types of tanks suitable for storing water in fairly large quantities at low levels. The capacity varies from 20,000 gallons to 150,000 gallons, so that the tanks are suitable for watering stock or for the irrigation of a small acreage, particularly in cases where good bricks are unobtainable, or where the size of the tanks makes brick-work dangerous. It will be noted that in all the designs the depth of water does not exceed four feet, for the reason that less concrete is put into the wall (which is more difficult to build), and more into the floor, which is an easier job. Also, a low wall, which can be built in two "lifts" of the framework, is simpler than a high one, for which the shuttering has to be raised three or four times.

Circular Tank.—The principle of this tank is that the water pressure is resisted almost entirely by tension in the steel reinforcing rings, the concrete merely promoting water tightness. The wall is composed of fine rich concrete, and is supported on a foundation ring of coarser concrete, which is unreinforced. The dimensions of the various sizes of tank are as follows (see figure 1):—

TABLE I.

Capacity, gallons.	Inside diameter of tank.	A	B	C	D
20,000	32 feet	4½ ins.	4½ ins.	12 ins.	12 ins.
50,000	50 ,,	5 ,,	5 ,,	15 ,,	12 ,,
100,000	71 ,,	6 ,,	4 ,,	15 ,,	12 ,,
150,000	87 feet, 6 ins.	8 ,,	4 ,,	18 ,,	12 ,,

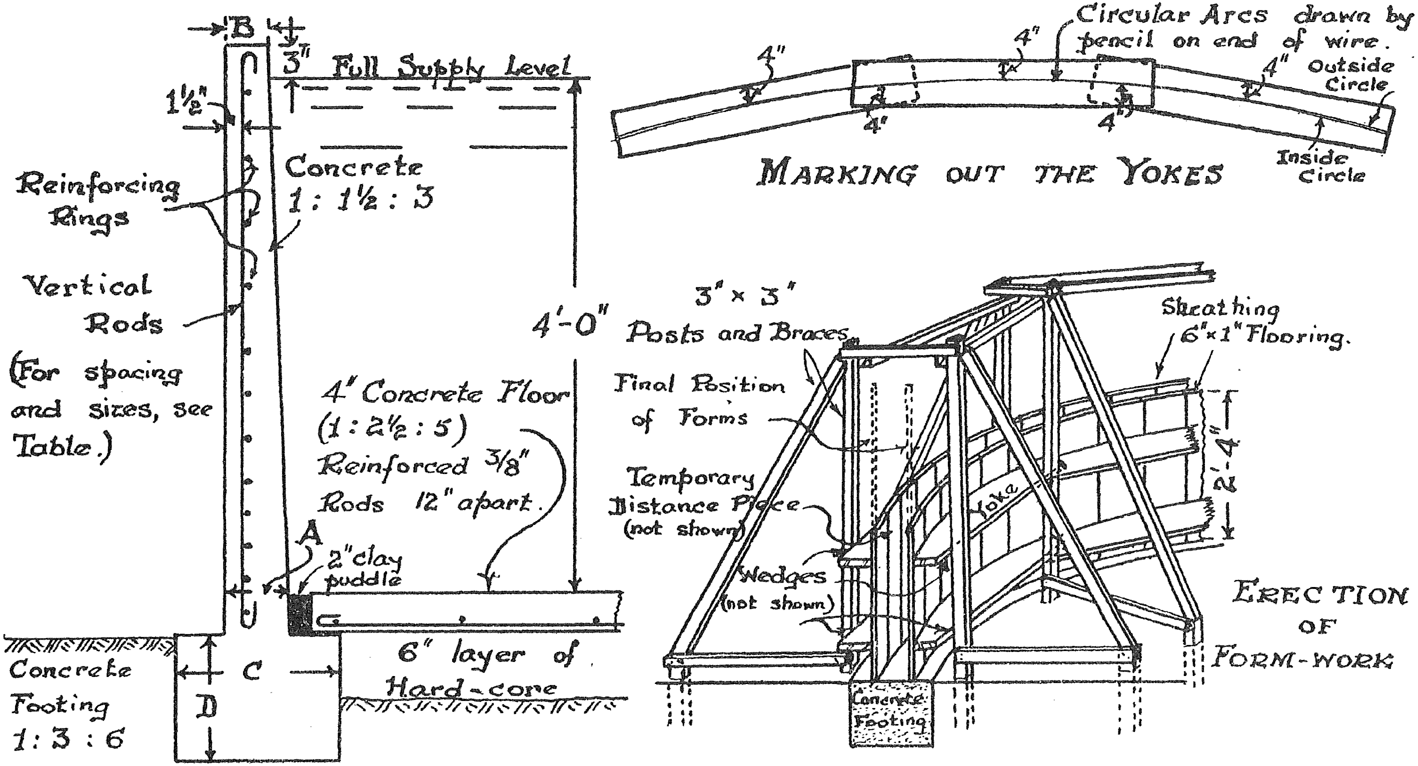


Fig. I.
Circular tank.

The reinforcement consists of rods placed vertically 1½ ins. from the outside of the wall, and of horizontal rods, wired to the verticals, forming continuous rings. At the joints of these rings the ends should be lapped 24 ins., bound securely together with baling wire, and the ends turned backwards. The following table gives the sizes and spacings of reinforcements:—

TABLE II.

Size of tank (Galls.)	VERTICAL RODS.		RINGS.		
	Size	Spacing.	Size.	No. of rings.	Spacing.
20,000	⅜ inch	18 inches	½ inch ½ ,,	5 2	6 inches 10 ,,
50,000	⅜ ,,	18 ,,	½ ,, ½ ,,	7 3	4 ,, 8 ,,
100,000	⅜ ,,	18 ,,	½ ,, ½ ,, ½ ,,	5 3 2	3 ,, 4 ,, 6 ,,
150,000	⅜ ,,	18 ,,	⅝ ,, ½ ,, ½ ,, ½ ,,	4 4 2 1	4 ,, 3 ,, 5 ,, 10 ,,

The construction of the wall may be briefly described as follows:—

The site should first be levelled. An iron peg is driven securely into the ground to mark the centre of the tank, and by means of a cord and nail the circles for the footing trench are marked. The trench is excavated to the exact width and 12 ins. deep, and is filled with concrete mixed 1 : 3 : 6. The top of the footing should be truly level and circular. The form-work is then erected (see sketch, figure 1). The actual shuttering consists of 6 ins. x 1 in. flooring cut into lengths of 2 ft. 4 ins. The circular shape is obtained by wooden "yokes," the marking out of which is shown in the upper sketch (figure 1). Two rows of posts are erected (in pairs) at intervals of 4 or 5 ft. and braced by horizontal and inclined struts. The posts are erected at a slightly greater distance apart than the greatest thickness of the wall, plus shuttering, plus yokes, and the yokes are adjusted to exact position by pairs of wedges, the thickness of the wall being

fixed by inserting temporary distance pieces between the floor board shutters. It is possible to build this wall in sections, but it is strongly recommended that the whole of the circumference should be built in one operation. When the first "lift" (2 ft. 4 ins. high) has been placed and allowed to set for seven days, the shuttering is released, raised to its higher position and again locked by the wedges.

The circular tank suffers from the disadvantage of complicated form-work, a given set of which will build only one size of tank.

Rectangular Tank (with Buttresses).—The wall of this type consists of two thin concrete slabs; one, the horizontal footing, and the other composed of vertical slabs each 7 ft. 6 ins. long, which transmit the water pressure to "buttresses" placed at the joints of the vertical slabs. This type of construction does away with the necessity for continuous pouring of concrete, as each slab has a definite joint abutting against the next, and the form-work is composed of short, movable standard sets, whatever the size of the tank. The dimensions of various tanks are as follows:—

TABLE III.

Capacity of tank (gallons).	Length.	Width.
50,000	67 feet, 6 inches	30 feet
100,000	75 feet	52 feet, 6 inches
150,000	90 ,,	67 ,, 6 ,,

By simply altering the number of "bays," the shape and size of the tank may be varied at will.

Views of this tank are shown in figure 2. The height of the wall (which is made of 1 : 2 : 4 concrete) is 4 ft. 3 ins.; the thickness at the top is 4 ins., and the bottom 6 ins. The base slab is 3 ft. 6 ins. wide, 6 ins. thick and consists of concrete mixed 1: 2: 4. To prevent leakage caused by a crack at the junction of the two slabs, a vertical strip of flat sheet iron should be cast into the concrete, as shown. The reinforcement consists of :—

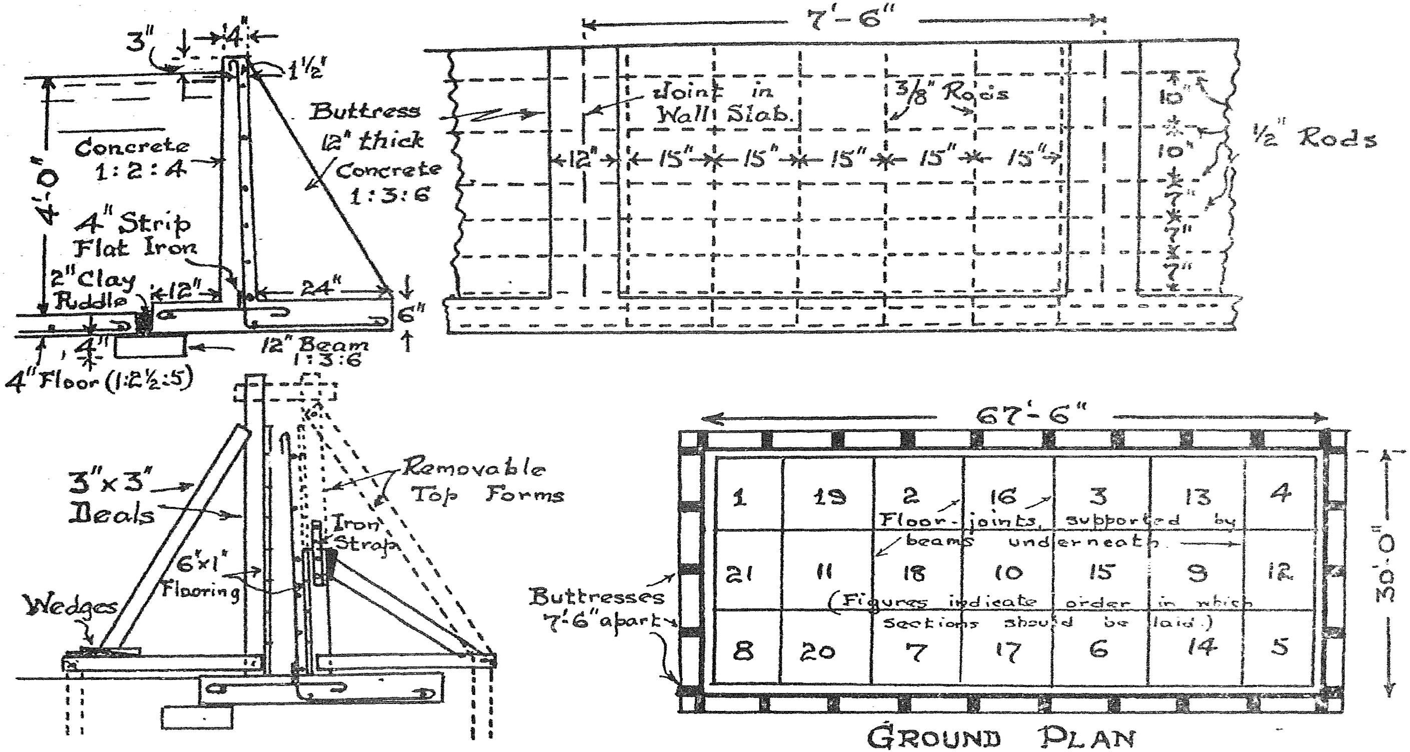


Fig. II.
Rectangular tank with buttressed wall.

(a) $\frac{3}{8}$ in. vertical rods 15 ins. apart, which are bent into the base slab as shown;

(b) $\frac{1}{2}$ in. horizontal rods spaced as shown; and

(c) $\frac{3}{8}$ in. longitudinal rods in base slab.

The buttress is unreinforced concrete (1 : 3 : 6), 12 ins. thick, and is cast against the vertical wall at the joints, after the wall is complete.

The form-work is illustrated in figure 2; the actual shuttering consists of 6 ins. x 1 in. flooring nailed to upright posts which are securely braced. The shuttering to the inside of the wall is in one piece, but it is suggested that the outside shuttering be made in two pieces, so that the lower part of the slab may be cast, and, when set, the upper portion is joined on and the pouring completed. This method reduces the height of concrete to be cast in one operation and permits thorough ramming of the concrete.

Rectangular Tank (Cantilever Wall).—This type of wall (figure 3) consists of a horizontal and a vertical slab and resists the water pressure purely by its own strength against bending, without the support of buttresses. In practice, however, vertical working joints are bound to occur, and hence it is safer to build the slabs in definite lengths of, say, 30 feet, and support the joints by buttresses. The reinforcement consists of:—

(a) $\frac{3}{8}$ in. vertical rods, which are bedded in the base slabs and spaced 9 ins. apart;

(b) $\frac{1}{4}$ in. horizontal rods 9 ins. apart;

(c) short $\frac{3}{8}$ in. transverse rods 9 ins. apart to reinforce the upper part of the base slab.

This type of wall possesses the advantage of simplicity of construction, but demands greater care in bonding the vertical slabs to the base slabs.

Floor.—The essential condition for the floor is that it should not be liable to settle unevenly and cause cracks. To this end a 6 in. layer of "hard-core" (rubble) should be carefully laid, levelled and rammed to provide an even and hard bed for the floor. In practice, it is usually necessary to reinforce the floor to prevent cracks, and a reinforcing mesh of $\frac{3}{8}$ in. rods is allowed for in these designs, but if it is pos-

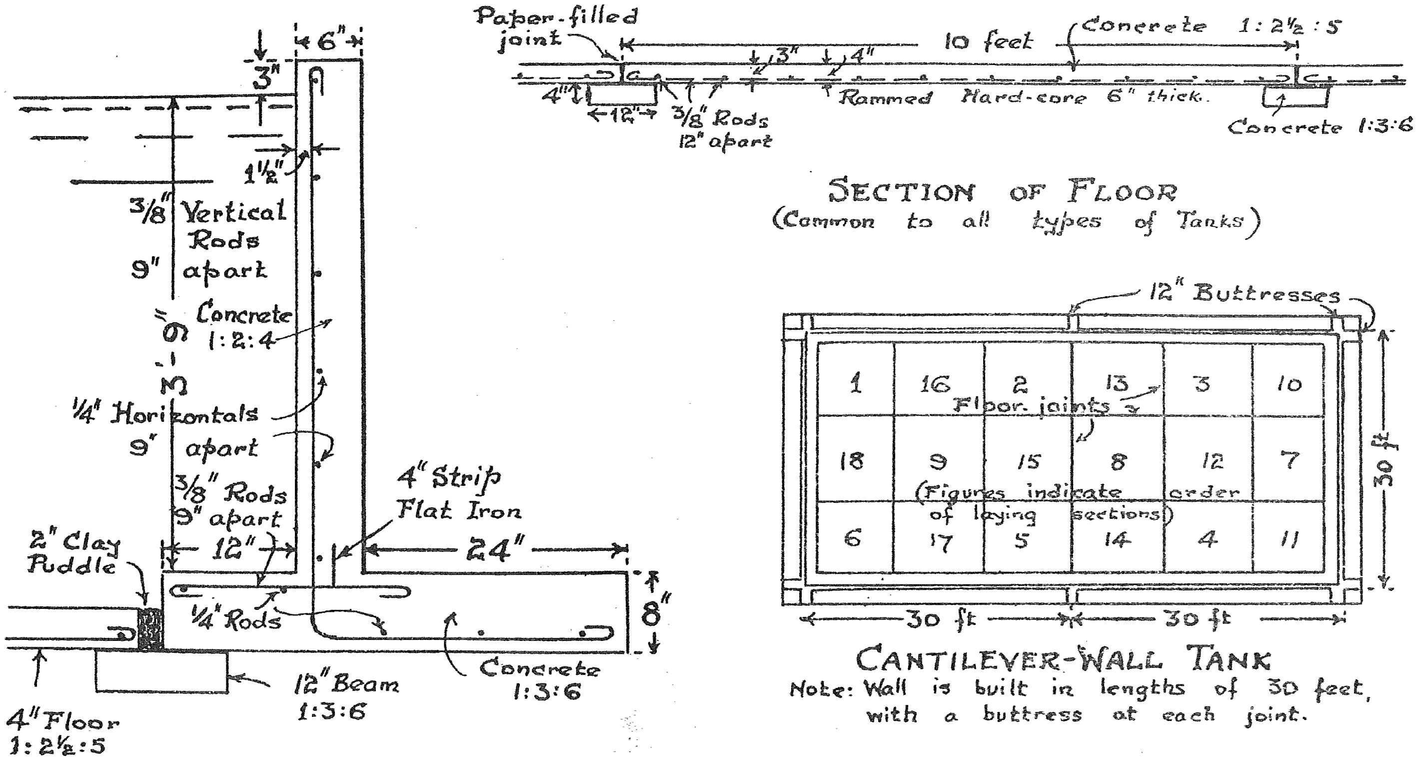


Fig. III.
Rectangular tank with cantilever wall.

sible to obtain a thoroughly even, hard bed, the reinforcement may be reduced or even omitted altogether. The question deserves careful consideration, for the steel in the floor represents a large portion of the cost, but each case should be considered on its merits. A mesh of wire netting ("pig netting") may be sufficient.

The floor should not be laid in one piece, but in squares about 10 ft. by 10 ft. This will be found to increase the ease of laying and has the important advantage of localising and even preventing cracks. The joints are filled with tar, thin laths or paper, and are supported on beams of concrete, as shown in figure 3. At the junction with the main wall a water-tight joint is also necessary, and to save expense the opening may be filled with well-puddled clay immediately before the tank is put into use.

Cost.—Table IV. gives quantities and estimated cost of materials for the various tanks. Costs are based on the following figures:—

Aggregate (stone and sand) ... 6/3 per cub. yd.
Cement ... ... 12/- per bag
Steel ... ... 4d. per lb.

It will be seen that, although the circular tank is the cheapest for the smaller sizes, the difference is slight, and for the larger sizes the rectangular tanks have the advantage, particularly if the cost of the steel in the floor be deducted in all cases. This advantage is greatly increased when the cost of form-work is considered, for the rectangular tanks lend themselves to a system of building in sections and hence require only a fraction of the timber.

Conclusion.—It is impossible in a short article to give a full specification of concrete work, and reference should be made to the article "Concrete on the Farm," which appeared in the *Rhodesia Agricultural Journal* of April, 1926, and was reprinted as bulletin No. 588. Any further information that may be desired will readily be given by the Irrigation Office of the Department of Agriculture.

TABLE IV.

Capacity, gallons.		CIRCULAR TANK.				RECTANGULAR TANK (Buttressed wall).				RECTANGULAR TANK (Cantilever walls, including buttresses).			
		Aggregate cubic yds.	Cement (bags).	Steel (lb.).		Aggregate cubic yds.	Cement (bags).	Steel (lb.).		Aggregate cubic yds.	Cement (bags).	Steel (lb.).	
				Wall.	Floor.			Wall.	Floor.			Wall.	Floor.
		22	70	513	640								
20,000	Cost ...	£7	£42	£8 10s.	£10 10s.								
	Total cost		£68										
		49	150	1,342	1,520	56	164	1,460	1,540	59	160	1,197	1,820
50,000	Cost ...	£15 10s.	£90	£22 10s.	£25 10s.	£17 10s.	£98 10s.	£24 10s.	£26	£18 10s.	£96	£20	£30 10s.
	Total cost		£153 10s.				£166 10s.				£165		
		81	242	2,230	3,050	91.5	262	1,900	3,100	98	273	1,625	3,640
100,000	Cost ...	£25 10s.	£146	£37 10s.	£51	£28 10s.	£158	£31 10s.	£52	£30 10s.	£164	£27	£61
	Total cost		£260				£270				£282 10s.		
		124	378	3,044	4,560	131	373	2,400	4,600	138	371	2,103	5,460
150,000	Cost ...	£38 10s.	£227	£51	£76	£41	£224	£40	£77	£43	£223	£35	£91
	Total cost		£392 10s.				£382				£392		

Tsetse Fly: Traffic Control.

By RUPERT W. JACK, Chief Entomologist.

An important aspect of the tsetse fly problem in Southern Rhodesia is produced by the very marked tendency of the fly (*G. morsitans*) to accompany moving objects for considerable distances. This habit is shared with other species of tsetse flies, but is, in any case, very decidedly developed in the species with which we have mainly to deal.

On account of this habit, flies tend to be carried out of the fly areas by animals, human beings and vehicles, and may be brought into contact with domestic animals in otherwise fly-free localities. Where there is a large amount of traffic to and from a heavily-infested fly area, definite spread of the fly may possibly be facilitated, but the most important aspect of the problem in this Colony at present lies apparently in the danger of transported flies causing sporadic outbreaks of trypanosomiasis amongst cattle in occupied country. It is to be realised that the very slow rate of breeding of tsetse flies, not exceeding an average of one offspring each fortnight, does not admit of new centres of infestation being readily established, except perhaps by a considerable number of individuals. Also, it is inferred by entomologists that flies carried out of their normal surroundings tend to return, and there is some experimental evidence to support this inference.

The flies are transported mainly on the backs of pedestrians and cyclists, and under the hoods, etc., of motor cars, though they commonly pursue fast-moving objects for a considerable distance on the wing.

It is generally agreed that, within limits, the faster the movement the more the flies tend to be attracted, and it also appears that the faster the movement the further the flies tend to be carried.

Observations have been made of flies remaining on pedestrians up to seven miles, and the usual limit is generally placed at about 10 miles. Indications of flies having been carried even further on pedestrians are not altogether lacking, but no direct observations of a fly remaining in position *for a greater distance have been made in this* Colony or are known to have been recorded elsewhere.

On cyclists, there is little doubt that the flies may be carried considerably further than on pedestrians, and examination of wayfarers at the southern fence in the Lomagundi fenced area has definitely incriminated cyclists as liable to carry fly on to the farms, whereas no pedestrians have been found so attended. The distance between the southern fence at the point when these observations were made and the nearest definitely infested point along the road was about 10 miles at the time.

It would be difficult to place a limit to the distance to which flies could be transported by motor car. It seems to depend largely upon how long the vehicle keeps moving, and 50 miles is not beyond the limit.

It used at one time to be considered that the "following" habit, in reference to pedestrians at least, was practically confined to the male flies. Under these circumstances such traffic could, of course, have little effect in causing actual spread of fly. Male flies in any case tend to be attracted to living animals, including man, in considerably greater numbers than the females, and on this account alone are certainly transported considerably more freely than the females, but there is little doubt that females are transported at times for considerable distances even by pedestrians, and presumably cyclists. In motor vehicles there is no doubt at all that they may be transported over big distances.

The female flies in a motor vehicle exhibit a tendency to secrete themselves in obscure positions, where they remain very quiet and are not easily disturbed. Sometimes, whilst thus skulking, they can be caught by hand without much difficulty. The skulking habit is not apparently altogether confined to the females, but is less frequent in the males. When trying to clear a car of flies by means of an insect

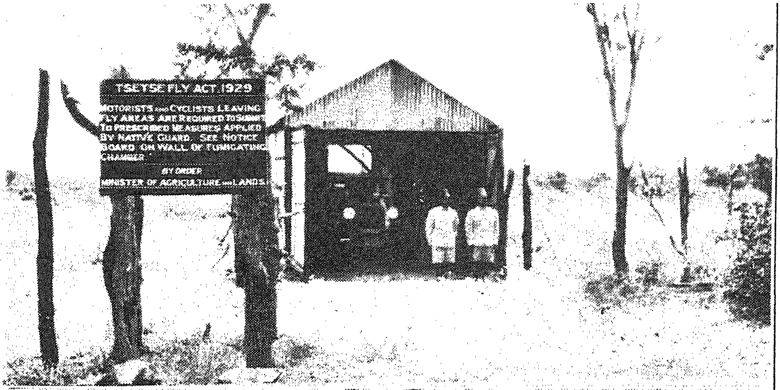


Fig I

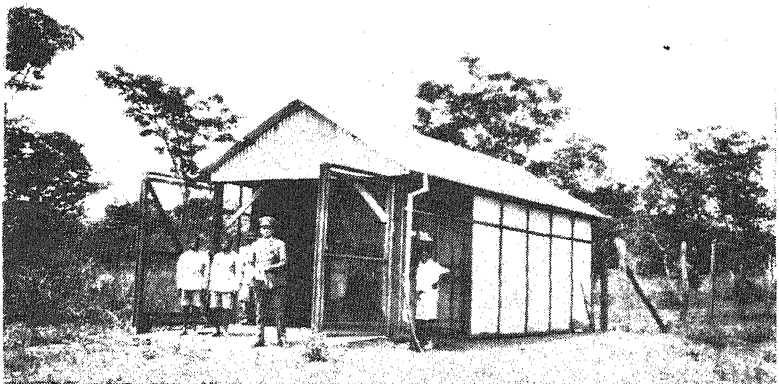


Fig II

Fig III

TSETSE FLY: TRAFFIC CONTROL.

Fumigating chamber, Hartley fly area.

Fig. I.—View of chamber showing exit doors open. Entrance into fly area by gate to left of notice board.

net these flies often present difficulties, as, instead of flying upwards when the net approaches in the course of a sweep, they tend to dodge behind some convenient obstacle. A certain number no doubt escape observation altogether by thus secreting themselves.

Whilst attracted strongly to moving motor vehicles, and tending to remain in such vehicles whilst they continue moving, the accumulated flies have been observed repeatedly to desert the vehicle to a large extent within a short period of its coming to a standstill. This may be particularly the case where other shade is near at hand.

On account of the danger from flies transported from the fly-infested areas into contact with stock in certain districts, a Bill to empower the Government to control traffic leaving fly areas was introduced into the Legislative Assembly last year and passed into law.

Under this Act the Governor-in-Council was empowered to proclaim any defined area as a fly area for the purpose of enforcement of regulations in respect to control of traffic, and the necessary powers for preventing tsetse flies being carried out of such fly areas by any form of traffic were also conferred.

It is one thing, however, to possess the necessary powers to deal with traffic from the tsetse fly standpoint and another to put such powers into practical effect. Considerable difficulties were foreseen from the outset.

In the first place it was clear that traffic control could not be applied in respect to the whole of the fly-infested country—in fact, only in one or two localities did such control appear really practicable and clearly necessary. These were the localities in which settlement and fly were in actual contact or sufficiently close together to make the risk from transported flies an appreciable danger. The existence of the game fences in the Lomagundi and Gatooma districts tended to facilitate traffic control in these important areas, and under Proclamation No. 10 of 1929 fly areas were defined in these districts, bounded on the sides towards the farms by the nearest of the game fences.

The amount of motor traffic entering and leaving the fly areas even in these well-settled districts is, however, on

the whole small. It is greater in the Gatooma area than in the Lomagundi area, but even there, passing cars are only occasional. In the Lomagundi area native cyclist traffic is, however, quite considerable, whilst in the Gatooma area it is comparatively small.

It was and is considered impracticable to control pedestrian traffic, and from what has been said above, it will be clear that the danger from such traffic is much less than in the case of faster-moving vehicles, including cycles, particularly where the game fences nearest the farms are some considerable distance from tangible "fly" along existing roads and footpaths. In the Lomagundi district the southern fence is throughout fully 10 miles from the nearest known spot where fly is to be met with at all regularly. In the Gatooma district the eastern game fence is, along one section, in definitely, if only lightly, infested country, but elsewhere the definite fly recedes several miles to the west. It is also to be realised that the distance to which the flies are normally carried by pedestrians is probably not greater than the distance to which occasional flies may range without such assistance.

Vehicular traffic, including cyclists, leaving the fly areas are restricted by regulation (Government Notice No. 720 of 13th December, 1928) to certain defined and guarded routes, one main exit being defined in the Gatooma area and two in the Lomagundi area.

The next step was to make provision for the cleansing of vehicles leaving the areas by the defined routes. Obviously for this purpose it was necessary to station guards at suitable gates, who would keep the keys of the gates and carry out the prescribed treatment. The personnel of such guards, however, called for careful consideration.

The amount of traffic in either of the areas does not justify the appointment of a European for the work, and it may be added that, in view of the fact that no man can be expected to remain on duty 100 per cent. of his time, two guards at least are required. A further consideration lies in the necessity for controlling native cyclist traffic, calling for much patrolling of the fence, on account of the existence of numerous footpaths suitable for cyclists. Obviously native police are best suited for this work.

The use of native police to have dealings with Europeans, although apparently a common enough procedure in other African colonies, is a more or less new departure in Southern Rhodesia, and constitutes a question of some delicacy. However, in view of the small amount of motor traffic confined, except for occasional hunting parties, to Europeans known to have certain interests within the proclaimed areas, who could be dealt with more or less on a personal basis, it has been decided to employ native guards at the gate and to appeal to all Europeans concerned to take a reasonable view of the position and to comply willingly with the regulations.

As it happens that no suitable roads affording access to either of the proclaimed areas exist, apart from those leading from the occupied country to be protected, any motorist entering the area can be fully acquainted with the conditions governing exit by means of suitable notices at the gate and handbills to be handed him by the guards on entry. Under such circumstances it is felt that no reasonable objections can be raised to submission to the prescribed treatment when leaving, especially as the danger to neighbouring stock owners from transported flies is so clearly apparent.

The guards, on account of the special duty for which they have been enrolled, have been issued with the uniforms of Agricultural Department native messengers and not regular native police uniforms, but they none the less have the status and powers of special native constables and are under the control of the officer in command of the district police. More directly they are under the direction of the rangers in charge of tsetse fly operations in the proclaimed areas.

Other difficulties have been chiefly of a technical nature, and these have proved by no means inconsiderable. It is an easy matter to assert or agree that vehicles leaving a fly area ought to be fumigated to rid them of tsetse fly, but it is far from being such an easy matter to arrange suitable procedure in practice. Different problems are clearly presented by motor vehicles on the one hand and animal-drawn vehicles on the other, but as the presence of susceptible animals in a

fly area is undesirable from almost every standpoint, their case has been met by excluding them altogether under the regulations.

In Uganda a procedure involving the use of "smoke houses" has been adopted comparatively recently to meet the danger of tsetse flies transported by motor vehicles. Under this plan both vehicles and occupants have been subjected to an intense smoking for a period of some seven to eight minutes in a chamber built of pole, dagga and thatch.

For the purpose of experiments a similar smoke chamber was erected in the Lomagundi district in this Colony last year, but the results obtained were not fully satisfactory. In the majority of experiments it was found that living flies were carried forward after the treatment, and it was judged that the method was not sufficiently thorough for the purpose required. Also appreciable danger from fire is involved, unless some rather elaborate and expensive method of pumping smoke into the chamber from a safe distance outside were adopted. Moreover, it is difficult to visualise Europeans submitting to the intense smoking for the necessary period. It is understood that more recently the occupants have not remained in the vehicles so treated in Uganda.

It is to be realised that the behaviour of tsetse flies when the occupants of a vehicle alight constitutes an important part of the problem. Some of the flies tend to alight with the occupants and to move out of the chamber with them. Treatment of the vehicle alone is, therefore, not sufficient. Flies which alight with the passengers and escape capture might also rejoin the vehicle when it leaves the chamber. All these points call for consideration, and it is realised that passengers and vehicles need separate treatment.

With regard to vehicles, the killing power of *smoke*, as produced by, say, wet grass, is comparatively small, and the experiments have indicated that that method alone is not drastic enough. *Sulphur fumes*, of which the insecticidal power is considerably greater, are unsuitable, as they attack certain metals and would therefore be deleterious to the vehicles themselves.

Other gases commonly used to destroy insects quickly are deadly poisonous, and call for skilled handling. *Carbon*

bisulphide is too inflammable and explosive for safety under the circumstances. A more suitable gas for use appears to be *hydrocyanic acid gas*, but this gas is so very deadly that there is reason to fear an accident through careless use, although it is in actual practice handled freely enough, even by natives, in connection with fumigation of citrus trees, etc. With a properly constructed and isolated chamber this gas could certainly be used safely enough with ordinary intelligence and care. There are certain other poisonous gases which are not inflammable and are safer in use than hydrocyanic acid gas, but experiments are needed to judge of their practicability for the purpose required, and with the advent of the dry season it may be possible to carry out such tests.

It is to be noted that the use of poisonous gases involves erection of a proper fumigating chamber, an expense not to be incurred without assurance as to its necessity.

In the meantime experiments in the use of proprietary insecticides such as "Flit" and "Komo" have shown that, in the absence of wind, it is quite possible to kill the tsetse flies under the hood of a car or in the "cab" of a lorry successfully, and with the additional aid of insect nets approximately to ensure that a motor vehicle is free from flies before proceeding. It is true that this procedure does not eliminate the personal equation, as is desirable, but it seems sufficient to meet the position in reference to a fly area such as that in Lomagundi, where, owing to the operations, there is now a considerable width of country between the farms and the definitely fly-infested country, and the latter is very infrequently penetrated by motor traffic. Pole, dagga and thatch chambers to protect the car from the wind during the clearing process have accordingly been erected at the two exit gates in this area and are in use at present. These have been constructed on the same plan as the smoke houses first used in Uganda.

In the above connection it is to be pointed out that even if cars are treated in chambers by a method certainly 100 per cent. effective, the whole treatment can hardly in practice be made similarly effective. It is not possible to prevent cars halting before being driven into the chamber, and tsetse flies tend to leave cars as soon as they halt or

they may leave at any time. In short, it is not possible to ensure that all the flies accompanying a vehicle enter the chamber with it, and such flies, lingering in the vicinity, may very well rejoin the vehicle when it proceeds on its way.

Flies alighting with passengers from a vehicle are caught in insect nets. The guards have strict instructions not to open the gates to allow vehicles to proceed until they are satisfied that, as far as is reasonably ascertainable, no living tsetse flies are present. Native cyclists leaving the Lomagundi area are cleared of flies by the guard in special mosquito gauze cages.

In the Gatooma area, to deal with a larger amount of motor traffic and also largely to admit of experiment with various methods, the fumigating chamber shown in the plate has been erected. This chamber has a mosquito gauze ante-chamber, the respective dimensions being:—

(1) Fumigating chamber—9 feet high x 20 feet x 12 feet.

(2) Mosquito gauze ante-chamber—9 feet high x 8 feet x 12 feet.

Construction is of timber and "Tentest," with a corrugated iron roof.

The dimensions allow of accommodation of large lorries in the chamber. A trap (not shown in the photographs) is provided at one side for insertion of chemicals, etc., if desired. The gauze ante-chamber admits of passengers being cleared effectively of tsetse flies by each other or by the guards. Here, however, a further difficult point arises, as Europeans would appear liable to object to being shut up in a cage with native guards until the latter consider it safe to open the door. It is, therefore, not insisted at present that Europeans remain in the ante-chamber to be cleared of tsetse flies, although it is desirable that they should. It is the duty of the guards, however, to see that no tsetse flies are carried back into the vehicles by the passengers. The ante-chamber is used in the same way as the detached cages in the Lomagundi area for the clearing of native cyclists.

This chamber admits of utilisation in various ways. At present the plan is to leave the connecting doors between

the dark chamber and the light gauze ante-chamber slightly ajar, all other doors being fast closed, and to treat the vehicle with "Flit," "Komo" or similar preparation, taking other measures also to disturb the flies, which, under such circumstances, tend to fly to the light. After a period of this treatment the connecting doors are closed and any flies which have entered the gauze ante-chamber are caught. A further examination of the vehicle is made with the connecting doors wide open, the insecticide being sprayed freely into all places where flies might be concealed. When satisfied that the vehicle is clear, the guard opens the further doors to allow it to proceed on its way.

It may be noted that experiments with "Flit" and tsetse flies in cars have given the result that no flies visibly affected by the vapour have subsequently recovered.

It has not so far been possible to experiment under field conditions with this chamber, owing to the very bad state of the road during the rains and the fact that the fly appears, with the progress of the operations, to have receded westward considerably in the vicinity of the road, making it necessary to run for a distance of about 10 miles in order to pick up flies in some numbers for the tests. A number of flies have already, however, been caught by the guards in this chamber.

It will, it is hoped, be realised that measures for the control of traffic are still in the experimental stage and that improvement in method is to be anticipated with experience. In the meantime the methods at present used cannot fail greatly to lessen the danger. It may also be mentioned that it is likely to prove necessary to apply the regulations to certain other localities in course of time.

Mycological Notes.

THE DIPLODIA MENACE.

[*In the April issue of the Journal there appeared an article which emphasised the importance of destroying maize trash after reaping and thus minimising the damage caused by diplodia and stalk borer. The Plant Pathologist in the notes which follow estimates the loss to the maize industry by diplodia attack at £100,000 per annum, and stresses the urgent need for "field sanitation." We hope that these two articles will have the effect of bringing home to farmers the seriousness of the menace and inducing them to take active measures to combat the evil.—Ed., R.A.J.*]

During the past season, the attention of the farming community has been frequently drawn to the serious losses occurring annually in the maize crop resulting from infection by diplodia. These losses are difficult to estimate, but can scarcely be put down at less than 15 per cent. of the crop when all phases of the disease are taken into account. Calculated at the rate of 10s. per bag, it will be seen that the maize industry is suffering a loss of approximately £100,000 each year, an amount which provides matter for serious thought. It may be asked how this figure is arrived at, and, although the subject has already been discussed in detail, it may be as well to state again the facts upon which these statements are built.

In the first place, there are two distinct phases of the disease:—

(1) Mouldy cob and infected plant.

(2) Infected seed.

The mouldy cob, with its white or pinkish fungoid growth, is familiar to all maize farmers, but there are few who can estimate the number of bags of discoloured grain in their crop which are unproductive of profit. Careful counts made on some twenty-five farms in widely scattered areas showed that an average of 48.7 per cent. of the cobs were infected by diplodia—some seriously, others slightly, but let us be conservative and say that, on an average, only one-fifth of each cob was mouldy, and we find that nearly 10 per cent. of the average crop of twenty-five farms consisted of discoloured grain. Some of this maize would be marketable, especially when put through a power sheller, but a high percentage of waste will in time adversely affect the good name which Southern Rhodesia has earned for high grade produce. For the purposes of our calculation, let us say that, of the 10 per cent. discoloured grain, 4 per cent. was marketable, leaving a dead loss of 6 per cent. as a result of infection of the cob.

Recent experiments with representative samples of commercial seed have shown that as much as 30 per cent. may be visibly infected by diplodia, and in pot trials the stand has been as low as 55 per cent. High grade seed has shown a reduction in stand of 15 per cent. as a result of diplodia attack upon the young plant, and even well selected farm seed of superior grade has been affected by as much as 10 per cent. of seedling blight, whilst a still further loss has been incurred by the stunting of plants and production of "nubbins." It is, therefore, evident that the original estimate of 15 per cent. annual loss, or in round figures £100,000, is in no way an exaggeration, and with all the talk that is at present going on about self-help in the farming industry, surely it is time that the farmer endeavoured to increase his yield per acre by reducing his losses. The beneficial effects of the use of fertilisers and green manures in this respect have been and are still being demonstrated, but a maximum return for money expended on these operations cannot be realised unless united efforts are made to exterminate the diplodia bogey.

It will at once be asked, "In what direction shall our efforts be turned?" and the answer is, "Field sanitation." So long as maize trash and stalks are allowed to remain

undestroyed upon the farm from season to season, so will diplodia remain with us in undiminished incidence. It is only by the destruction of this rubbish that we can hope to prevent infection of cobs, because, hidden from sight within the debris, are thousands upon thousands of microscopic spores which rise into the air with each puff of wind, and are transported far and wide to perpetuate the fungus at the expense of the growing crop. Arguments are put forward that maize trash has not been destroyed before, therefore it is not possible to carry out this operation, but the hard fact must be faced that diplodia cannot be exterminated as long as the trash remains. The question really boils down to, "Are you maize growers going to lose £100,000 a year for the sake of some old maize stalks?"

Seed treatment, both in experiment and practice, has given excellent results by increasing the stand and vigour of the plants, but a serious disease, such as diplodia, cannot be eradicated by sprinkling powder over the seed any more than small-pox can be eradicated by dusting the baby with carbolic powder.

The elimination of the source of infection is just as necessary for the control of one disease as for the other.

J. C. H.

School Forestry in Southern Rhodesia.

In the Report of the Education Commission, 1929, a recommendation was made (*vide* paragraph No. 6, page 154) to the effect "That opportunity should be taken to stimulate interest in forestry by encouraging schools to obtain an area and plant it with trees of economic value, as an endowment for the school in the future."

Both the headmaster of the Prince Edward Senior School, Salisbury, Mr. Somerville, and the principal of the Junior School, Mr. Allen, displayed the keenest interest in developing the idea. Last year they approached the Municipality of Salisbury and obtained a lease of 50 acres of land situated near the school hostels. On this area it is proposed to plant trees of economic value.

A provisional committee was formed to make the necessary preliminary arrangements and arrange about finance.

The area has been ploughed and is about to be fenced. Arrangements are in hand for raising the necessary trees and planting them during the ensuing planting season.

A constitution was drawn up by the provisional committee and on the 8th April submitted to a meeting of the masters and boys. The draft constitution was accepted and the "Prince Edward School Forestry Association" was formally constituted. A managing committee has been elected and the first committee meeting under the constitution was held on the 10th April. This committee formally approved of and confirmed the actions of the provisional committee.

The objects of the Association are clearly set forth as follows:—

(1) To promote the highest quality of citizenship and disinterested public service.

(2) To cultivate an enlightened opinion in favour of—
   (a) caring for natural forests;

(b) afforestation with suitable trees to supplement the indigenous supplies;

(c) to establish and maintain school plantations and to utilise moneys realised from the sale of the produce of such plantations for any desirable though not essential purposes in the school environment which do not properly fall within the Government's obligations.

On the occasion of the formal constitution of the Association, Mr. Henkel gave an address, basing his remarks on the objects of the Association.

The importance of forestry for the Empire was stressed and historical examples were quoted of the disasters that have followed when forests have been destroyed. In particular in this Colony is it necessary to conserve and properly manage the indigenous forests and to take steps to cultivate suitable trees, particularly softwoods, so as to supply as far as it is possible all the Colony's timber requirements with home-grown material.

It is proposed to give instruction to the boys on the general principles of forestry and to teach them correct methods of raising plants from seed, handling the seedlings and planting them in the plantations. All work is to be carried out by the boys. After planting the trees the boys will tend the young trees, watch their development and will be taught correct methods of thinning the woods.

The educational value of the instruction was emphasised and the importance of learning early the duty of public service—of doing work for the benefit of the whole community without hope of reward, and the building up of an asset for the good of those who shall in future years attend the school.

Notes from the Irrigation Branch.

Soil Erosion.—Requests for advice on soil erosion protection works continue to increase rapidly, and the farmers who are taking active steps to check this menace are more generally distributed over the whole Colony than formerly. The number of visits to farms on this type of work totalled 124 last year, as compared with 53 in the previous year, this large increase being a striking commentary on the interest now being taken in this matter. It is difficult adequately to cope with the increased demand for advice on soil erosion, as the services of an engineer are usually only required in the months of September and October, when the lands are ploughed and cleared prior to planting. If, however, it were possible to have the work more evenly distributed throughout the year it would be a great advantage to all concerned. A number of farmers applied for the services of an engineer in April and May this year in order that protection work could be put in hand on lands which had been under "green manure" crops.

It is also encouraging to find that the number of farmers who possess surveyor's levels is increasing. It is realised that, once practical instruction has been given in the use of this instrument and the methods to be adopted in setting out the works with the general principles involved, it is possible for the farmer to proceed without frequent visits from an engineer, except when problems of a special nature arise. It has also been suggested that it would be a great convenience if Farmers' Associations purchased levels and hired them out on application to their members.

An interesting and valuable communication was recently received through the Chief Chemist from the Imperial Bureau of Soil Science, which contained a summary of the published experimental work on soil erosion and of the recorded results obtained by the use of preventive measures. The urgency of soil erosion as a national problem in the United States is shown by the recent appropriation of

160,000 dollars by the Federal Government for investigation of the causes and means of its prevention, and the conservation of rainfall by terracing and other means. In that country it is estimated that the amount of plant food lost by soil erosion is twenty-one times that taken by the crops, and that erosion is serious on about 60 per cent. of the cultivated land. It is interesting to note also that early last year the Government of Ceylon appointed a committee to study soil erosion with a view to the introduction of legislation conferring compulsory powers on the authorities in cases where it is found to be necessary. In the United States and Ceylon actual quantitative experiments have been carried out at a few stations. In the former country it is found that bare fallow soil ploughed 8 inches deep loses 0.26 inch of surface soil per annum, which confirms certain deductions made in this Colony, viz., that the loss from steeply sloping cultivated land is approximately ¼ inch per annum. More data are required in this Colony relating to the amount of erosion caused by individual heavy rainfalls and to the effectiveness of the contour ridges in causing the deposition of silt. Last season Mr. Ludgater, of Poorti Valley, and Captain Chilcott, of Banket, took observations on the quantity of water discharged from their ridges and the amount of silt carried by this water after heavy storms. Although last season was not a very favourable one for this type of observation, the result tended to show that probably less than 1-100 inch of soil per annum was permanently lost from steeply sloping cultivated land which had been properly contour ridged. That the efforts being made in this country to combat soil erosion are not being overlooked in the surrounding territories is shown by the fact that a request has recently been received from Nyasaland for the services of Mr. Haviland to advise them generally on the best soil conservation methods to adopt.

Irrigation Development.—There has been a steady demand for advances from Irrigation Loan Funds to cover the cost of the construction of irrigation works, for sinking boreholes and for soil erosion protection works. Of the loans sanctioned to date those granted for irrigation works and for boring are about equal in amount, with only a couple of small loans for soil erosion protection works.

Certain of the irrigation loans were granted in respect of works which were completed just prior to loan funds being available. Schemes which will probably reach construction stage at an early date include: (1) The construction of a masonry storage dam on the Beri River, which, in conjunction with an existing storage dam, will provide water for the irrigation of 25 acres on the farm Good Hope, in the neighbourhood of Gadzema; (2) the construction of storage weirs and the installation of pumping plants on the Bembezaan River for the irrigation of 80 acres on a portion of the East Clare Estate, Que Que; (3) the construction of an earthen storage dam for the irrigation of 25 acres on the farm Naseby, near Que Que; (4) the installation of a small pumping plant for the irrigation of five acres on the farm Rainbow's End, in the vicinity of Gadzema.

Irrigation Reconnaissance Survey.—The survey party, consisting of Messrs. Culverwell, Ferreira and White, is at present engaged in surveying the canal routes below the Umshandige Gorge and in demarcating the areas of suitable irrigable land. The Lands Department also intend sending down an Agricultural Inspector at an early date to this area in order that full details may be available of the land commanded by the scheme, and that the unalienated land may be suitably divided in the event of the scheme materialising. From the preliminary estimates it appears that a water rate of not more than 30s. per acre irrigated per annum would fully cover all interest and redemption charges of the total cost of the scheme. A comprehensive and valuable report on the operations of the survey party last season has recently been received from the Irrigation Engineer, Matabeleland, which has been submitted to the Minister for consideration.

Visit of the Maize Association to the Salisbury District.

The Mashonaland Farmers' Association this year extended an invitation to members of the Maize Association, and the Lomagundi farmers in particular, to be their guests for three days from the 31st March to the 2nd April.

The opening day was selected in order to synchronise with the Farmers' Day at Gwebi and there was a large attendance of both bodies at the farm.

The programme for the 1st April consisted first of a visit to Mr Duncan Black's farm, Selby, thence to Messrs. Newmarch and McLean, Glenara, for morning tea, thence to Mr. G. Lamb, Eskbank, where a light luncheon was provided, and thence to the Salisbury Agricultural Experiment Station, where tea was provided by the Department of Agriculture.

The party which assembled at Mr. Duncan Black's farm at 9.30 a.m. numbered about 100, and all were keenly interested in inspecting the magnificent herd of pedigree Aberdeen Angus cattle for which Selby farm is now so well noted. Mr. Black had his different troops of cattle in close proximity to the homestead and gave the visitors full particulars in regard to their breeding, feeding and general management. The Selby pastures were much admired, and on all sides one heard expressions of surprise that such magnificent cattle could be reared with such a small measure of extra feeding. A point noted with interest by many was the fact that there are no permanent sheds for cattle on any part of Selby farm and that all feeding resorted to is done in paddocks or in open yards.

By the time Messrs. Newmarch and McLean's farm was reached the party had grown in numbers, and the utmost interest was shown in the methodical layout of this farm and the very fine crops which were to be seen.

Pedigree Aberdeen Angus cattle at Selby farm, near Salisbury.
(Mr. D. Black.)

Ploughing under sunflowers for green manure on Glenara farm during the visit of the Maize Association, 1st April, 1930.

Those who had not previously visited Glenara voiced the opinion that they had not thought such a farm existed in Rhodesia, and on more than one occasion were reminded by their friends that the British farmers, when they visited Southern Rhodesia in May, 1926, stated that nowhere in South Africa had they seen a more beautiful and better managed estate than Glenara.

Mr. Newmarch this year is resorting extensively to green manuring, and for this purpose is using both Sunn hemp and sunflowers. The illustration shows a heavy crop of sunflowers being ploughed under very satisfactorily by an International Deering Tractor, operating a disc plough. A most pleasant early morning tea was provided by Mr. and Mrs. Newmarch on the shady lawns in front of the homestead, at the conclusion of which important function the visitors expressed their hearty appreciation in the usual manner. The party then left for Eskbank farm, where after luncheon the visitors were shown over the gardens by Mr. Lamb and were also taken to see an interesting crop of potatoes raised from seed imported this season and planted unusually late in the year on dry land without irrigation.

On the way to Salisbury the party stopped for a few moments at the entrance of Mr. C. C. Macarthur's farm, Komani, on the Golden Stairs road, and here inspected his fine flock of grade Suffolk sheep; these animals were in magnificent condition and were greatly admired by all.

The Salisbury Agricultural Experiment Station was reached about 3.45 p.m., and after tea had been partaken of, the visitors broke up into small parties and were conducted around the station by the Chief Agriculturist and members of his staff.

The first investigations described and inspected were those undertaken with clovers to ascertain their probable suitability to the wet sand vlei areas of the Colony. Luxuriant plants were shown growing in tins, unprovided with drainage. The plants had been grown in these tins for three years, and for the five to six months of each rainy season had been kept with 1-2 inches of water submerging their roots. This treatment appeared to have had no injurious effect on the four varieties experimented with—the most resistant to such conditions

being Strawberry clover, White Dutch and Alsike. It was explained that as a result of these trials it was confidently believed that pure clover or mixed clover and grass pastures could without any great difficulty or expense be established over large extents of our sand vlei areas.

Attention was next directed to the plot of kudzu vine, a perennial leguminous fodder suitable for deep, upland soils, and possibly for establishing in the pockets of fertile soil which occur in many of our ranges of hills and kopjes. The plot inspected had been down for 10 years and showed no decrease in vigour, although during that period it had produced at the rate of 76 tons of green fodder an acre. Emphasis was laid on the ease with which kudzu vine can now be established by means of "rooted crowns" as opposed to the old methods of propagation by means of seed, or rooted cuttings or runners.

Probably the demonstration which most interested the visitors was that of the manner in which exhausted land can be brought back to fertility by means of green manuring, combined with the use of artificial fertilisers. The plot selected for this experiment was one which had been continuously planted to maize without treatment for fifteen years and on which the yield had fallen to less than two bags an acre. In 1927-28 the whole plot was treated with 250 lbs. per acre of bone and superphosphate. On one half maize was planted and on the other a mixture of Sunn hemp and velvet beans for ploughing under. The whole plot had this season again been planted to maize. The half planted to maize in 1927-28 had yielded about 6 bags an acre and this season looked like yielding 5-5½ bags an acre. The yield on the section green manured last year was variously estimated by those present at anything from 12-15 bags an acre.

Much interest was evinced in the plant breeding work with oats, sunflowers and potatoes, in the various experiments with soya beans and edible canna, and in the fertiliser trials in which applications of rock phosphate are compared with similar applications of superphosphate and bone and superphosphate—in the one case applied direct to the maize crop and in others to the green manure crops immediately preceding the maize.

Munktells Crude Oil Tractors.

By B. G. Gundry, A.I.Mech.E., Irrigation Branch,
Department of Agriculture.

The writer has recently had opportunities of making short tests on the Munktells crude oil tractors, and as these machines are an innovation in this Colony, it is thought that the following notes may be of general interest, especially in view of the low cost of crude oil as compared with paraffin.

In the first place it must be realised that the semi-Diesel type of engine with which these tractors are fitted works on an entirely different principle from the ordinary four-cycle petrol-paraffin tractor engine. Briefly, the working cycle of these engines is as follows:—

When the piston is at its lowest point the cylinder is filled with air, which is compressed during the upward stroke of the piston, fresh air being at the same time drawn into the crankcase. At a fixed point on this stroke the fuel oil is automatically injected into the combustion chamber in an atomised condition. The incandescent bulb in the combustion chamber having, before the starting of the engine, been heated to a sufficiently high temperature, the atomised fuel is converted into a gas and mixes with the compressed air. As the piston comes to the top of its stroke this mixture explodes, owing to its high compression and temperature, and forces the piston down on its working stroke. As the piston approaches its lower dead centre it uncovers the exhaust port, and the burnt gases are released into the exhaust pipe. Immediately afterwards the piston uncovers the inlet port and releases the air previously compressed in the crankcase into the cylinder, where it clears out the remaining burnt gases and remains to be compressed by the piston on the commencement of its next cycle.

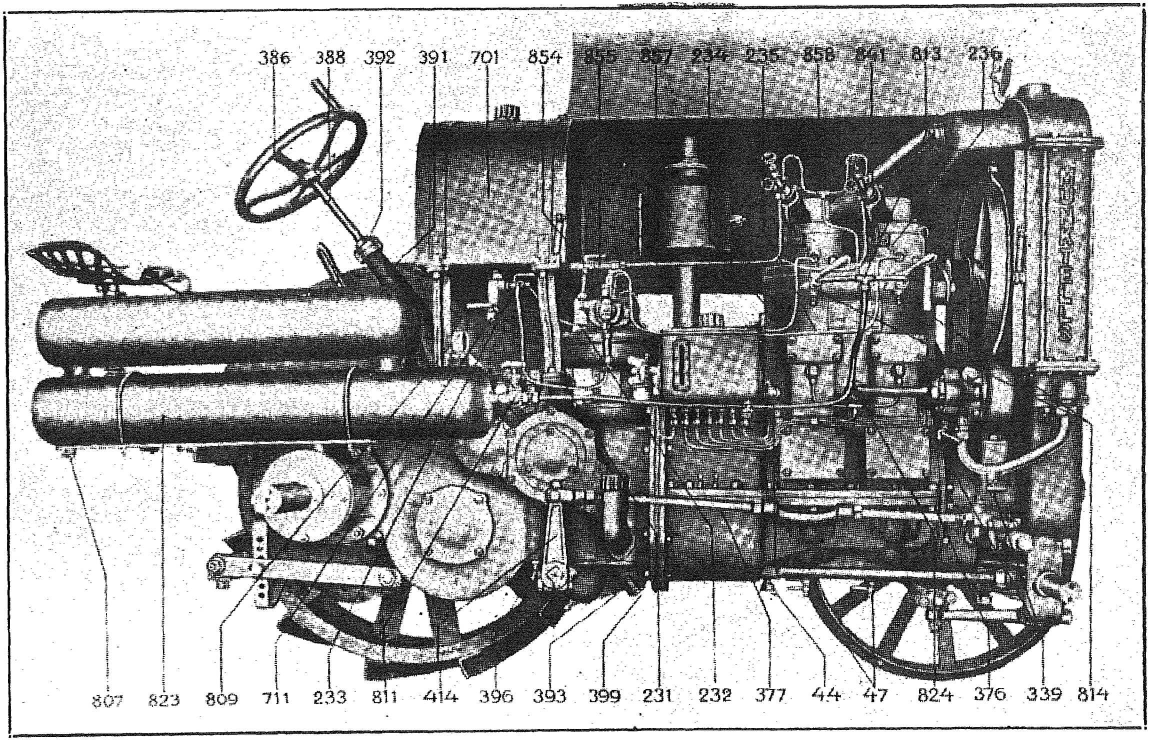
It will be seen from the foregoing that the engine operates on the two-stroke cycle, i.e., one impulse or working stroke to each complete revolution of the crankshaft, instead of one working stroke to every two revolutions of the crankshaft, as is the case with the ordinary motor car engine. The starting up of the engine, although not a complicated operation, takes a few minutes to perform.

A blow lamp type of heater is permanently attached to each cylinder head for heating up the hot bulbs. These lamps are operated by compressed air from a cylinder, which is also an integral part of the machine, and fuel oil from the main tank. They are lighted in a moment, and when the hot bulbs have been sufficiently heated—which takes about five minutes—the engine is started by admitting compressed air to one of the cylinders. The heating lamps are then turned out and the engine continues to run entirely automatically, requiring no adjustment of any sort.

The speed of the engine is controlled entirely by the governor, which operates direct on the fuel injection pumps, varying the length of their strokes, and thus the amount of fuel injected into the cylinders, according to the load on the engine. The governor is set by the makers so that the engine will run at its most efficient speed; the driver, therefore, is left free to devote all his attention to steering the tractor and controlling whatever implement he may be using. Although the compressed air cylinder, heating lamps and governor give the engine a somewhat complicated appearance, it must be remembered that there are no poppet valves and tappets or electrical equipment to give trouble.

These tractors are built in two sizes—22 and 30 h.p. They are fitted with three speeds forward and a reverse. The dry plate disc clutch is particularly gentle in operation. In general these machines appear to be of very sound design and construction throughout, and while under observation gave no trouble, mechanical or otherwise.

It is only fair to refer here to a rumour that has been heard to the effect that the cylinder heads of these engines are liable to "burn out," owing to over-heating. It may be stated that, while new to this Colony, tractors fitted with this type of engine have been operating satisfactorily in Europe for a number of years.



"Munktells" tractor. Sectional view. (Numbers not referred to in text.)

The results obtained during ploughing tests are given hereunder. In all cases the implement used was doing good work, the depth of cut was measured from the surface of the unploughed ground to the bottom of the furrow, and the average of a number of such measurements is quoted in each case.

The time occupied in turning is in all cases included in the ploughing time, so that the results will approximate very closely to actual practical conditions.

It is regretted that this Department has not had more opportunities of submitting other makes and types of tractors to similar tests under local conditions, as it is felt that the results obtained would be of considerable value to those who are contemplating the purchase of one of these machines, as the capital cost and running cost must be carefully considered in relation to the amount of work which can be carried out by the tractor each year.

Munktells Crude Oil Tractors.

Results of Ploughing Tests.

Nominal H.P. of tractor.	Locality.	Type of soil.	Description of plough.	Depth of ploughing.	Acreage ploughed per hour.	Fuel consumption per acre.	Cost of fuel per acre at 11½d. per gallon f.o.r. Salisbury.
22	Gwebi	Medium loam (ploughing in sunflowers)	Ransomes 3-furrow disc	8 inches	0.78 acre	1.75 gallons	1s. 8½d.
22	Gadzema	Sand veld (old land)	,, ,,	6 ,,	0.74 ,,	1.74 ,,	1s. 8d.
30	Gwebi	Virgin, medium loam in very hard condition	Cockshutt 4-furrow disc	5½ ,,	0.87 ,,	2.3 ,,	2s. 2½d.
30	Gadzema	Sand veld (old land)	,, ,,	6¼ ,,	1.0 ,,	2.01 ,,	1s. 11d.

Agricultural Costings at the Gwebi Farm.

FATTENING FOR BEEF.

By H. G. Mundy, Dip.Agric. (Wye), F.L.S., Chief Agriculturist.

At first sight the costings for 1929 for the fattening of beef bullocks disclose an average gross loss of £2 9s. 6d. per beast over the 70 head fattened. From this figure, however, must be deducted the Government bounty of ½d. per lb. live weight on beef steers exported overseas. Twenty head were disposed of in this manner, the bounty amounting to £54 18s. 9d., thus reducing the loss over the total number to £1 14s. a head. In this year's costings also, the value of the manure made at 10s. per ton has been credited to the fattening bullocks, and with the inclusion of this amount, the net average loss per animal is shown to be 14s. 3d.

An examination of the following statements and tables, compared with those published in this Journal under a similar heading for the year 1928, reveals certain of the causes which have contributed to this loss. Other causes, which are not disclosed in the statements and tables, also affected the profit and loss account. Amongst these are the following:—

Thirty-six bullocks purchased from the Inyanga Estate were put up for fattening for shipment overseas. Owing to the early date of the shipment only 20 head were judged to be ready when the time for despatch arrived, and the remaining 16 animals had to be carried on in the yards for a longer period than usual until, with the advance of winter,

local prices for fat stock improved. As a result, 10 of these bullocks were fed for 170 days, which is 40-60 days longer than the normal fattening period. Others of the same batch were fed for shorter periods, but still exceeded the usual 100-120 days.

Towards the end of the year 10 bullocks were consigned to Johannesburg, but owing to a train running late, could not be weighed in Salisbury, and when weighed later in Bulawayo, four just failed to pass the embargo weight of 1,050 lbs. In consequence it was decided to sell them all in Bulawayo, the price realised being only £8 10s. each, which, if the cost of railage to Bulawayo is deducted, was considerably less than they would have fetched if sold on the farm or in Salisbury.

Speaking generally, the fattening was not carried on so successfully in the year under review as in 1928. Three bullocks died in 1929 as against one in 1928, and of these three, two had been up for fattening several weeks before death occurred. Five old trek oxen were put up for a period, but did not fatten satisfactorily and were later thrown out, the cost of their feed having to be borne by the beasts that were sold.

Statement H discloses the fact that whereas "services" in 1928 were assessed at £89 7s. 10d., in the 1929 costings this figure had risen to £141 7s. 10d., a sum altogether out of proportion to the small additional number of animals fattened. This increase was due to a change in the system of allocating costs. In 1928 the proportion of the farm manager's and stockman's salaries charged against fattening bullocks was based on the time each day which it was considered they gave to this item of the farming operations. In the present costings, the figure has been arrived at on the relationship which the total costs of foodstuffs, native wages, grinding of foods and all other items shown in Statement C —except "European wages"—bear to the total annual expenditure on the whole farm.

Finally, the initial purchase cost of the bullocks fed in 1929 was approximately £1 a head higher than those fattened in 1928, while the net average amount realised per head on sale was £4 2s. 8d. less.

The increases and decreases in the average cost per beast in 1929 may be summarised as follows:—

		£	s.	d.
(a) Purchase cost of animal	plus	0	19	1
(b) Foodstuffs produced on farm	plus	0	2	10
(c) Foodstuffs purchased	minus	0	1	6
(d) Services	plus	0	12	6
Total	plus	£1	13	8

The total quantity of foodstuffs fed per bullock per day in 1929 was 32.41 lbs., valued at 4.92d. In 1928, 27.70 lbs. a day per beast was fed, valued at 4.59d., the difference lying in the larger proportion of farm-grown as compared with purchased foodstuffs used last year.

In 1928 the Government bounty was ¼d. per lb. live weight, whereas in 1929 it was increased to ½d. per lb. live weight. This increase, spread over all the beasts fattened, reduced the loss per beast by 19s. 9d.

Hay used for bedding has not been charged up, and the manure produced by the fat oxen has been taken into account at 10s. per ton.

Note.—The staff of the Gwebi farm is responsible for the records and allocations on which this report is based, and the office of the accountant to the Agricultural and Veterinary Departments for the compilation of the tables.

Bee-Keeping in Rhodesia.

WHY AND WHEN TO RE-QUEEN.

By T. W. Savory.

My last article was upon queen rearing in its simplest and most successful form for the bee-keeper with but a few hives, and who therefore requires new blood only from time to time. The present article will consider why and when such an operation is required. The necessity to re-queen may be due to one of several circumstances, as:—

(1) Where from illness or accident—a rare occasion—the queen has died.

(2) When, by reason of her age, it is thought advisable to terminate the queen's life, and give the colony a fresh one.

(3) When, by reason of the unsatisfactory working details of the colony, some of which are described in the March issue of this Journal, the bee-keeper considers it advisable to get fresh blood or breeding into it.

Taking these items *seriatim*:—

(1) As the whole work of a colony is practically stopped as soon as it is queenless, care should be taken to see that such a state does not exist any longer than is possible. When it is remembered that the queen can and often does lay as many as 3,000 eggs a day, this stoppage may easily mean the loss of that number of worker bees that would otherwise be storing honey. This state of queenlessness can be ascertained by the way that the inmates behave inside and outside the hive. Root says: "When they stand around on the alighting board in a listless sort of way, with no bees going in with pollen when other bees are thus engaged, it is well to open the hive and take a look at them.

The bees will set up a peculiar cry—that is to say, all through the hive they will be buzzing as if in distress, and they surely are, because they have no queen. As soon as a hive of this kind is opened they will begin this cry of distress; this buzzing of the wings is so marked that the practised bee-keeper recognises it as an indication that a colony may be queenless, and if he finds no eggs nor young brood at a time of the year when both should be present, he can be quite sure that the hive has no queen." When this decision is arrived at, re-queen at once.

(2) The generally accepted age of a good working queen is from two to three years; some may live from four to six years, but they are the exception, and at this age are probably of little use. The workers are very quick to notice any failing in the queen's capacity to do her work properly and vigorously, and take particular care to terminate her life when advisable. Recently, many English and American bee-keepers have made a point of re-queening every year; this, in countries where pure Italians and other breeds are to be had for the asking at from a price of 5s. upwards, has a good deal to recommend it, but here in the two Rhodesias, where such strains are difficult and expensive to obtain, a longer period of life can often be given to her majesty with entirely good results. Here an ordinary queen should last for a minimum of two years; the writer has had some which at the close of their third year have produced an excellent crop of workers and honey, in no way showing any decline of her power.

(3) The poor qualities of a colony and therefore of its queen, as they may be shown throughout the hive, were roughly given in the March issue of this Journal, and may be amplified as follows:—

By her egg-laying power.—The queen can lay as many as 5,000 in a day, but her usual limit is about 3,000. In the height of the season she may average as low as 1,000 daily. The bee-keeper should carefully note the egg-laying capacity, and if the colony is found to be poor in the number of workers in her first season, discard her for this reason alone, as a weak colony never pays under any circumstances.

In the temper of the hive.—If under a careful and quiet operator the bees are proved to be constantly vicious, destroy

the queen at once, otherwise there will always be trouble when working with it. There will always be the probability of irritating others close by, for more certain than any other defect, the viciousness of the queen will descend to the whole colony.

The hive's actual honey result.—This, after all, is the greatest function of the workers from the view-point of the bee-keeper, and if they put up a good record at the end of the honey-flow, in filling their supers, that queen may be depended upon as one of the best to breed from, and should be looked after as one would look after any other prized stock. On the contrary, should the workers be seen continually loafing on the outside, and the return of honey be poor, re-queen at once.

The inside state of the hive.—This also is an item of much moment and should be well watched. Should any colony be found to be using an undue amount of propolis or bee glue, this would be a sound reason to discard and replace the queen. Excessive use of this material now and again occurs, and is a great detriment to the proper handling of the hive. It gives the owner much extra work in cleaning all the frames, etc.; and it causes considerable irritation amongst the bees when the quilts and lids are torn asunder for hive examination. The loss of time and labour to the workers, which should be collecting and storing honey, must be considerable, while in such cases every possible nook and crevice throughout the hive is filled with this propolis.

It should be the aim of every progressive bee-keeper to keep and maintain his colonies in as high a state of production and general efficiency as he would any other farm stock. This can only be achieved by the time-honoured rule of selection. By careful watching of the bees in their indoor and outdoor lives, by noting their production and other points, some of which are here given, one can soon judge with a fair certainty upon the standard of the stock required, and by keeping or replacing the queens the apiary (be it small or large) can be brought as near to perfection as possible. Then it will be found that bee-keeping will give as good a return in proportion as any other side-line conducted with the same care.

A List of Plant Diseases Occurring in Southern Rhodesia.

(*Continued.*)

By J. C. F. Hopkins, B.Sc. (Lond.), A.I.C.T.A., Plant Pathologist.

COTTON (*Gossypium* spp.).

Angular Leaf Spot *Bacterium malvacearum* E. F. Sm.
Anthracnose *Glomerella gossypii* Edgert.
Black Arm *Bacterium malvacearum* E. F. Sm.
Black "Rust" *Macrosporium nigricanthium* Atk.
Boll Drop. Physiological.
Boll Rot *Bacterium malvacearum* E. F. Sm.
Internal Boll Disease *Nematospora coryli* Pegl.
Internal Boll Rot *Epicoccum ? purpurascens* Ehrenb.
Leaf Spot *Phyllosticta* (? *malkoffii* Bub.).
"Sore Shin" *Rhizoctonia solani* Kühn.

COWPEA (*Vigna catjang* Walp.).

Mildew *Erysiphe polygoni* DC.
Root Parasite *Melasma orobanchoides* Engl.
Stem and Pod Blight *Cladosporium vignæ* Gardner.

Crinum sp.

Rust *Æcidium crini* Kalchbr.

Cryptocarya sp.

Leaf Disease *Meliola cryptocaryæ* Doidge.

CUCUMBER (*Cucumis sativus* L.).

Anthracnose *Colletotrichum lagenarium* (Passer.), E. & H.
Leaf Spot *Cercospora* sp.
Mildew *Erysiphe cichoracearum* DC.

CUSTARD APPLE (*Anona reticulata*).
Leaf Disease *Phyllosticta* sp.

CYPRESS (*Cupressus* spp.).
Leaf Spot *Pestalozzia funerea* Desm.

DAHLIA (*Dahlia* spp.).
Leaf Spot *Cercospora* sp.
Smut *Entyloma dahliæ* Syd.

DELPHINIUM (see Larkspur).

DOCK (*Rumex nepolensis*).
Rust *Æcidium rubellum* Gmél.

Dodonæa viscosa.
Mildew *Oidium* sp.

EGG PLANT (*Solanum melongena* L.).
Leaf Spot *Alternaria solani* (Ell. & Mont.) Jones & Grout.

Ekebergia arborea.
Rust *Æcidium* sp.

EUCALYPTUS (*Eucalyptus* spp.).
Dieback. Drought.
Root Disease *Macrophomina phaseoli* (Maubl.) Ashby.
[= *Rhizoctonia bataticola* (Taub.) Butl. Group C of Haigh.]

Euclea sp.
Rust *Cronartium gilgianum* P. Henn.

Eugenia sp.
Sooty Mould *Capnodium* sp.

Eschscholzia.
Wilt *Fusarium* (? *oxysporium* var.).

FIG (*Ficus* spp.).
Leaf Spot *Cercospora bolleana* (Thüm.) Speg.
Leaf Spot *Tubercularia fici* Edgert.

FLAX (see Linseed).

GERANIUM (*Pelargonium* spp.).
Rust *Uromyces geranii* (DC.) Otth. & Wartm.

GLADIOLUS sp.
Leaf Blight *Macrosporium commune* Rabenh.

GRAPE (*Vitis* spp.).

Anthracnose *Glœosporium ampelophagum* (Passer.) Sacc.

Downy Mildew *Plasmopara viticola* (Berk. & Curt.) Berl. & de Toni.

Internal Decline of Fruit. Undetermined.

Powdery Mildew *Uncinula necator* (Schw.) Burr.

Ripe Rot *Glomerella cingulata* (Stonem.) S. & v. S.

Sooty Mould *Capnodium* sp.

GRASSES.

Aristida.

Rust *Puccinia* sp.

Brachiaria.

Ergot *Claviceps* sp.

Mould *Fusarium heterosporum* Nees.

Chloris.

Rust *Puccinia chloridis* Speg.

Cynodon.

Leaf Spot *Phyllachora cynodontis* (Sacc.) Niessl.

Smut *Ustilago cynodontis* (P. Henn.) Bref.

Dactylis.

Rust *Puccinia graminis* Pers.

Eragrostis.

Smut *Ustilago* sp.

Heteropogon.

Rust *Puccinia versicolor* Diet & Holw.

Melinis.

Leaf Spot *Phyllachora* sp.

Panicium.

Blight *Helminthosporium* (? *turcicum* Passer.).

Root Parasite (Witch Weed) *Striga lutea* Lour.

Smut *Ustilago heterospora* P. Henn. & Evans.

Paspalum.

Ergot *Claviceps paspali* Stev. & Hall.

Pennisetum.

Leaf Disease *Beniowskia sphœroidea* (Kalchbr. & Cke.).

Setaria.
Smut *Ustilago evansii* P. Henn.
White Rust *Beniowskia sphæroidea* (Kalchbr. & Cke.).

Sorghum sudanense.
Rust *Puccinia purpurea* Cke.

S. kaffrorum (see Kaffir Corn).

Sporobolus.
Blight *Helminthosporium ravenalii* Curt.

GROUNDNUT (*Arachis hypogea* L.).
Leaf Spot *Cercospora personata* (Berk. & Curt.) Ell. & Ev.
Leaf Spot *Phyllosticta* sp.
Root Rot *Sclerotium rolfsii* Sacc.
Rosette. Virus.

GUAVA (*Psidium guajava* L.).
Anthracnose (*Glœosporium psidii* (Delacr.) Sheld.
[= *Glomerella cingulata* (Stonem.) S. & v. S.]
Leaf Spot *Pestalozzia* sp.

Hibiscus spp.
Leaf Spot *Cercospora* (? *gossypina* Cke.).
Leaf Spot *Phyllosticta* sp.
Leaf Spot *Tubercularia* sp.
Rust *Æcidium* (? *garckeanum* P. Henn.).

HOLLYHOCK (*Althea rosea* Cav.).
Leaf Spot *Colletotrichum malvarum* Bri. & Casp.
Rust *Puccinia malvacearum* Mont.

Hydrangea spp.
Leaf Spot *Macrophoma* sp.

INDIGO (*Indigofera* spp.).
Rust *Ravenelia lævis* Diet. & Holw.
Rust *Uredo indigoferæ* Doidge.

KAFFIR BEAN (see Cowpea).

KAFFIR CORN (*Sorghum kaffrorum*).
Covered Smut *Sphacelotheca sorghi* (Link.) Clint.

Leucas martinicensis.
Mildew *Oidium* sp.

Linaria (cultivated).
Mildew *Erysiphe polygoni* DC.
(*Oidium* only).

LINSEED (*Linum usitatissimum* L.).
Wilt *Fusarium lini* Boll.

LOQUAT (*Eriobotrya japonica* Lindl.).
Anthracnose *Colletotrichum* [? *glœosporioides* (Penz.) Sacc.].

MISTLETOE (*Loranthus* sp.).
Leaf Spot *Pestalozzia* sp.

LUCERNE (*Medicago sativa* L.).
Leaf Spot *Pseudopeziza medicaginis* (Lib.) Sacc.
Rust *Uromyces medicaginis* Passer.
Violet Root Rot *Helicobasidium purpureum* (Tul.). Pat.
[*Rhizoctonia crocorum* (Pers.) DC. only.]

LUPIN (*Lupinus* spp.).
"Sore Shin" *Fusarium trachiephilum* (E. F. Sm.) Wollenw.

Magnolia sp.
Leaf Blotch *Cladosporium* sp.
Red "Rust" *Cephaleuros mycoidea* Karst.

MAIZE (*Zea mays* L.).
Collar Rot *Fusarium scirpi* Lamb. & Fantr.
Dry Rot *Diplodia zeæ* (Schw.) Lév.
Ear Rot *Giberella saubinetii* (Dur. & Mont.) Sacc.
Leaf Blight *Helminthosporium turcicum* Passer.
Leaf Spots *Macrosporium* sp.
Epicoccum sp.
Mould *Cladosporium herbarum* (Link.) Fr.
"Pinking" Mendelian segregate.
"Purpling" Mendelian segregate.
Rust *Puccinia maydis* Béreng.
Smut *Sorosporium reilianum* Kühn.
Streak. Virus.
Witch Weed *Striga lutea* Lour.

MANGO (*Mangifera indica* L.).
Anthracnose *Glœosporium mangiferæ* P. Henn.
Fruit and Leaf Blight *Bacillus mangiferæ* Doidge.

Leaf Blotch. Drought.
Mildew *Oidium* sp.
Root Disease *Rhizoctonia bataticola* (Taub.) Butl.
[Group A of Haigh.]

MARROW (*Cucurbita pepo* L.).
Mildew *Erysiphe cichoracearum* DC.

Monotes sp.
Black Rust *Parodiella* sp.
Leaf Spot *Giberella tinctoria* Mass.

MULBERRY (*Morus* spp.).
Mildew *Phyllactinia corylea* (Pers.) Karst.
[*Ovulariopsis moricola* Delacr. only.]

NASTURTIUM (*Tropæolum majus* L.).
Mildew *Phyllactinia corylea* (Pers.) Karst.

OAK (*Quercus* spp.).
Mildew *Microsphæra alni extensa* Salm.
[*Oidium quercinum* only.]

OATS (*Avena sativa* L.).
Covered Smut *Ustilago kolleri* Wille.
Leaf Spot *Alternaria* sp.
Loose Smut *Ustilago avenæ* (Pers.) Jens.
Rust *Puccinia lolii* Niels.

Ocimum canum Sims.
Mosaic. Virus.

ONION (*Allium cepa* L.).
Downy Mildew *Peronospora schleideni* Ung.
Mould *Macrosporium porri* Ell.

Parinarium mobola Oliv.
Leaf Spot *Phæosphærella parinarii* (P. Henn.) Theiss. & Syd.

Pavetta sp.
Rust *Æcidium* sp.

PALM (*Phœnix* spp.).
Leaf Spot *Graphiola phœnicis* (Mong.) Poit.

PAW-PAW (*Carica papaya* L.).
Anthracnose *Glœosporium papayæ* P. Henn.
Damping-off *Rhizoctonia solani* Kühn.
Fruit Rot *Phoma* sp.

Fruit Cracking. Frost injury.
"Frenching." Undetermined.
Leaf Spot. Frost injury.
Mildew *Ovulariopsis papayæ* Van der Byl.
Stem Rot. Undetermined (associated with old trees).

PEA (*Pisum* spp.).
Leaf Spot *Ascochyta pisi* Lib.
Mildew *Erysiphe polygoni* DC.
Root Rot *Sclerotium rolfsii* Sacc.
Wilt *Fusarium* (? *vasinfectum* var. *pisi* v. Hall.)

(*To be continued.*)

Pretoria Agricultural Society's Innovation in Seed Maize Sections.

We have received a copy of the Pretoria Agricultural Society's prize list for its 1930 show, which is to be held in the Town Hall, Pretoria, on 12th, 13th and 14th June.

The prize list is a very comprehensive and attractive one. Numerous gold, silver and bronze medals, certificates and society diplomas, in addition to an attractive range of silver cups, figure in the awards. Classes in live stock, dairying and agricultural produce are well provided for. A feature of special interest to us in Southern Rhodesia is the introduction into the society's prize list of an innovation which, besides making the maize classes more interesting, should prove of great benefit to producers of reliable pedigree seed maize and other cereals. The society wish to get Southern Rhodesia interested in their new scheme, and to enable Rhodesian growers to participate a special class has been provided for Salisbury White maize. This should commend itself to growers desirous of obtaining a market for most classes of reliable farm seeds. Exhibits in these new

classes are samples of 10 lbs. weight of grain, accompanied—in the case of maize—by five untrimmed cobs of maize, which according to the show classes represent (1) 25 bags to 100 bags; (2) 100 bags or more of seed for sale.

All samples are tested for germination by the Union Department of Agriculture, who submit a report on each sample to the secretary of the show. The samples contained in glass jars, with germination certificates attached, are exhibited on the show and are then judged on a score card. After the show the samples are staged in the show society's office until their next show. The exhibit or sample is a composite one, drawn from at least 25 per cent. of the bags available for sale. In addition to the first prize of £3 and second prize of £2, a silver cup is awarded for the best individual exhibit of seed maize scoring the highest number of points according to the score card. Samples of the required weight must reach the secretary of the show at least ten days before the date of the show, with the accompanying ears.

Exhibitors are required to forward with their exhibit a sworn declaration, executed in the presence of a Justice of the Peace or notary public, to the effect that the sample submitted for exhibition is a fair composite sample of the bulk of the seed offered for sale.

The society has also introduced classes for farm seeds on similar lines to those of the maize classes. The exhibits or samples of farm seeds consist of 10 lbs. weight of grain, which according to the show class represents five bags or more of seed. Exhibits in these classes of special interest to Rhodesian growers are:—

Sunn hemp.
Sunflower.
Beans.
Ground nuts.
Wheat.
Barley, rye and oats.
Maize.

Prize lists are obtainable from the Secretary, P.O. Box 426, Pretoria.

When the Milk Recorder Comes.

Issued by the Dairying Branch.

In view of the fact that cows in test are often found to have dropped mysteriously and unaccountably in yield upon the occasion of the official recorder's visits, perhaps a few suggestions in the form of "don'ts" to farmers may be helpful.

(1) "Don't," on the day that the recorder is expected, give your cows an extra feed of concentrates with a view to increasing the milk; this procedure may result in a marked decrease in yield, which will not compare very favourably with previous weighings.

(2) "Don't" deliver to the native milkers a long lecture on the importance of obtaining, during the recorder's visit, every ounce of milk possible, as this makes the boys over-anxious and nervous, a state of affairs which may be reflected in a decreased yield of milk.

(3) "Don't" impress upon the natives that a Government official is coming who will most assuredly run them in if they fail to get extra milk from the cows.

(4) "Don't," when the recorder has arrived, walk up and down behind the animals, paying more than usual attention to the milking; this only makes the boys nervous. "Don't" remonstrate with them for not obtaining the usual quantity of milk. This upsets both boys and cows and reduces the milk yield.

(5) "Don't" make any alteration in your time methods of milking and feeding or general procedure, but carry on in the ordinary way as though the milk recorder was not present.

SOUTHERN RHODESIA.

Preliminary Estimate of the Area under Principal Crops and the Probable Yield therefrom, 1929-30.

ISSUED BY THE STATISTICAL BUREAU.

About 90 per cent. of the returns due from farmers giving the areas planted or to be planted to the principal and other crops for the season 1929-30 have now been received.

The following preliminary results for 1929-30 compare as follows with the returns *from the same farms* in 1928-29:—

Crop.	Provisional returns for 1929-30 Area planted. Acres.	Provisional returns for 1928-29 Area planted. Acres.
Maize	302,013	289,172
Cotton	7,742	1,602
Tobacco	10,081	15,174
Ground nuts	8,315	8,833
All other crops	58,878	49,473
Total of above ...	387,029	364,776

Assuming that the area for 1929-30 reported to date bears the same proportion to the total area cultivated by all farmers in 1929-30 as the corresponding figures for 1928-29 given above bear to the actual cultivated area for the latter year, the following estimate for the total cultivated area in 1929-30 is obtained.

The known figures for 1928-29 have been added for comparison.

Crop.	1929-30. Area (estimated). Acres.	1928-29. Area (actual). Acres.
Maize	340,000	325,300
Cotton	8,000	1,800
Tobacco	12,000	17,800
Ground nuts	9,000	9,700
All other crops	66,000	55,400
Total cultivated area	435,000	410,000

As regards the probable outturn of crops for the current season it may be said that the normal yield per acre (average of the previous ten years) for the three principal crops has been as follows:—

Maize 5.00 bags per acre; tobacco 470 lbs. per acre; and ground nuts 7.1 bags per acre.

Assuming that these yields are obtained in 1929-30, the total outturn may be provisionally estimated at: maize, 1,700,000 bags; tobacco, 5,640,000 lbs.; and ground nuts, 63,900 bags.

In the case of cotton the difficulty arises that U.4, the new variety now chiefly planted, has not hitherto been grown on a commercial scale in the Colony, so that past records do not exist.

The crop at present promises well, and if the probable yield be estimated at 300 lbs. of seed-cotton per acre (a conservative estimate), the total yield might amount to 2,400,000 lbs. of seed-cotton, yielding about 800,000 lbs. of lint or 2,000 bales of 400 lbs.

The foregoing estimates are provisional and subject to amendment from time to time as later reports on the condition of the crops come to hand from the Bureau's crop correspondents.

The difference between the estimated and actual total yields in the cases of cotton, tobacco and ground nuts is largely accounted for by the fact that the acreages on which the estimates for the season 1928-29 were based were those which farmers stated at the beginning of the season were planted or to be planted during that season, whereas in each case the final return of land cropped was considerably less.

Correspondence.

[*No responsibility is accepted by this Journal for the views expressed by correspondents.*]

The Editor,
The Rhodesia Agricultural Journal.

Sir,

Cross Fertilisation of Crops.

I have noticed that within the last few years crops which need cross fertilisation, such as pumpkins, are not yielding such returns as formerly. I also notice an absence of bees. Now, I know bees are very annoying, especially when they insist upon invading motor cars—to which they are very partial. How many swarms are killed each year because of this trespass to motor cars? There must be hundreds of swarms killed each year, and this would naturally have an effect on crop fertilisation.

Yours, etc.,
L. MALZER.

Meadowlands,
P.O. Makwiro,
9th April, 1930.

The Editor,
The Rhodesia Agricultural Journal.

Sir,

Hay Values.

The following figures are taken from "Farming in South Africa," March issue, and put the matter in such a way that those who cut hay simply cannot afford to neglect them:—

"Veld grass cut every fortnight has a protein content of 12 per cent.

"When the grass is four months old the protein content is 5.2 per cent.; and when eight months old, the age at which it is cut for hay (presumably in the Union), it has only 2.96 per cent.

"With paspalum:—Cut every fortnight, protein content 16.11 per cent.; cut every four months, protein content, 9.4 per cent.; cut every eight months, protein content 7.07 per cent."

Those who cut their hay late are therefore deliberately wasting two-thirds of its protein content. This should make some of us think!

I am, etc.,
J. M. Moubray.

Chipoli,
Shamva,
5th April, 1930.

Review.

"THE SOYA BEAN AND THE NEW SOYA FLOUR."

By C. J. Ferree: William Heinemann (Medical Books), Ltd., London.

The book aims at indicating the great value of soya bean flour as a general food ingredient in the diet of the human race. Emphasis is laid upon its digestibility, the fact that the bean contains fat soluble vitamins A and B in sufficient strength to give an accessory food, factor optimum, for proper nutrition and growth, and the prevention of rickets. This vitamin value is of great importance in relation to the use of soya flour for enriching deficient cereal products and starchy foods.

It is claimed that a new method has been found of preparing soya bean flour without detracting from its food value, while the original value of the oil is retained without any tendency for the flour to become rancid. This Berczeller

flour (the discovery of the special method of preparation was by Dr. L. Berczeller, of Vienna) is said to be specially suitable for diabetes.

Interesting information is given of the production, uses, etc., of soya beans in all parts of the world, while at the end of the book are recipes for various dishes which can be prepared from the meal. These sound most appetising, if only on account of the large number of other well-known ingredients with which the soya flour is to be compounded.

Under the heading "The Soya Bean in South Africa," we are informed that it has been proved, as a result of extensive experiments during recent years, that the soya bean is a crop which can be grown throughout South Africa, and there can be no hesitation in saying that any concern working on modern lines in South Africa should be able to compete well with other markets. Further, that the cost of growing soya beans is below that of growing maize. We fear that in these generalisations the author is somewhat wide of the mark. The value of the crop as a stock food is well recognised, but as yet throughout South and Central Africa it has not proved universally successful and economic to grow, and, indeed, as far as our present knowledge goes, there are comparatively few sections in which it is a success. The present market value of the beans is cited at £11 per ton on the English market, or approximately 11s. per bag of 200 lbs. High acre yields—considerably greater than those normally obtained here at present, unless under exceptional circumstances—will be required, or a better overseas price, before the soya bean will commend itself to Rhodesian and South African farmers as a crop to be grown for export.

In this Colony efforts are being made by the Department of Agriculture to produce higher yielding strains with non-shattering seed habit, and to learn the best methods of soil treatment to afford maximum returns. Similar work, it is understood, is also in progress in the Union of South Africa, but so far as Southern Rhodesia is concerned we are not yet able to recommend the soya bean as a commercial crop.

H. G. M.

Southern Rhodesia Weather Bureau.

MARCH, 1930.

Pressure.—The mean pressure for the month was generally slightly above normal.

The outstanding pressure phenomena were the movements of a very intense offshoot of the equatorial low on the 8th, 9th and 10th. This low passed up the east coast with a very marked trough and the resulting rainfall was very poor. A high followed this low and was central to the south from the 13th to the 19th, being reinforced on the 18th with a second high. At the latter end of the month the equatorial low was very active and the depressions were of unusual intensity. The first originated in the north-west on the 21st and was off the east coast on the 24th; the second moved to the coast on the 26th and the third was on the south coast on the 31st.

Temperature.—The mean maximum temperatures were generally below normal, particularly in the midlands. They varied from 6.1° F. below normal at Driefontein to 2.1° F. above normal at Umtali.

The mean maximum temperatures were about normal, varying from 1·5° F. above normal at Enkeldoorn to 1.9° F. below normal at Sinoia.

The mean temperatures were below normal, varying from 2.9° F. below normal at Driefontein to 1.6° F. above normal at Umtali.

The mean humidity was about normal.

Rainfall.—The rainfall for the month amounted to 3.96 ins., or slightly below normal.

The totals to date for the various zones are as follows:—

Zone.	October to March, ins.	Per cent. of normal.
A	22.4	93
B	14.9	72
C	24.2	80
D	27.4	84
E	24.8	81
F	35.6	75

Rain Periods.—Only one period of importance occurred during the month.

Showers were numerous on the 1st and heavy rain fell in Mashonaland on the 2nd. Showers were general on the 3rd and from the 4th to 6th fairly general in Mashonaland. Showers were numerous from the 7th to 11th. On the 12th and 13th showers were general in the south and east. The period then broke up with scattered showers mostly in the north from the 14th to 20th. A few showers were again reported from the 26th to the end of the month.

RAINFALL.

STATION.	1930. Feb.	Mar.	Total to end of period.	Normal rainfall to end of period.
ZONE A.:				
Bubi—				
Bembesi Railway ...	3.40	1.18	18.75	22.75
Glenarton ...	2.84	1.93	15.77	24.26
Inyati ...	1.00	2.85	21.35	23.46
Judsonia ...	2.02	1.78	15.17	n.s.
Martha Farm ...	1.64	1.67	14.89	19.08
Nduba Farm ...	1.76	0.68	15.24	n.s.
Shangani Estate ...	4.10	1.18	19.47	24.51
Bulalima-Mangwe—				
Centenary ...	1.97	7.36	26.15	21.85
Kalaka ...	4.41	3.32	23.69	22.41
Riverbank ...	3.50	2.02	18.41	24.03
Solusi Mission ...	3.64	1.78	17.47	22.75
Bulawayo—				
Fairview Farm ...	0.54	2.73	23.57	21.24
Keendale ...	1.27	1.56	21.26	21.20
Lower Rangemore ...	1.91	1.36	17.26	22.93
Observatory ...	0.70	1.44	16.52	22.69
Waterworks ...	1.45	2.92	17.32	23.22
Gwelo—				
Brockenhurst ...	2.51	3.65	18.88	n.s.
Frogmore ...	1.81	...	...	n.s.
Gwelo Gaol ...	1.66	1.63	17.98	25.11
Riversdale Estate ..	...	...	...	28.47
Somerset Estate ...	3.45	1.91	14.94	24.37
Insiza—				
Orangedale ...	4.93	1.68	18.22	26.36
Shangani ...	1.59	1.47	16.20	23.23
Thornville ...	1.10	2.81	14.23	23.44
Nyamandhlovu—				
Gwaai Reserve ...	1.44	3.04	20.98	23.97
Gwaai Siding ...	2.75	3.47	21.24	n.s.
Naseby ...	3.03	3.93	18.13	22.36
Nyamandhlovu Railway ...	1.03	1.05	13.22	21.96
Sebungwe—				
Gokwe ...	5.48	6.12	29.34	29.77
Umzingwane—				
prings ...	1.16	1.58	16.60	23.56
Wankie—				
Dett ...	5.53	0.11	27.29	22.21
Matetsi Railway ...	2.38	3.45	18.70	...
Ngamo Railway ...	3.81	1.05	19.62	25.52
Rosslyn ...	3.56	6.02	26.12	n.s.
Sukumi ...	3.66	2.14	21.99	26.92
Tom's Farm ...	1.93	2.79	18.47	n.s.
Victoria Falls ...	4.10	2.40	26.90	n.s.
Victoria Falls Railway ...	3.96	3.01	27.29	27.11
Wankie Hospital ...	2.45	1.85	17.36	22.70

RAINFALL—*(Continued)*.

Station.	1930. Feb.	1930. Mar.	Total to end of period.	Normal rainfall to end of period.
Zone B.:				
Belingwe—				
Bickwell ...	2.05	4.28	21.41	22.12
Sovelele ...	1.62	1.70	11.37	20.41
Tamba ...	2.33	1.08	14.16	18.31
Wedza ..	1.05	1.66	12.86	23.11
Bulalima-Maugwe—				
Bruwapeg ...	1.68	1.44	17.45	21.11
Empandeni ...	3.02	2.69	16.17	21.06
Fallowfields ...	1.89	2.18	15.30	n.s.
Garth ...	1.54	0.75	12.77	25.16
Maholi ...	...	...	...	27.22
Retreat ...	2.67	2.94	18.32	20.79
Sandown ...	1.20	4.53	17.42	25.71
Semokwe Reserve ...	0.54	3.23	17.11	n.s.
Tjankwa ...	1.41	1.69	13.89	26.76
Tjompani ...	3.41	1.84	20.82	24.10
Chibi—				
Bubye ...	1.55	...	...	14.63
Mtendelende ...	0.94	1.45	13 28	20.35
Nuanetsi Homestead ...	4.01	3.50	17.40	15.75
Nuanetsi N.C. ...	2.88	3.47	18.53	n.s.
Gwanda—				
Gwanda Gaol ...	1.30	1.71	13.53	20.14
Limpopo ...	0.39	.94	7.47	...
Mazunga ...	0.64	0.62	11.35	16.00
Mtetengwe ...	0.80	2.60	10.38	12.23
Tuli ...	1.71	1.17	15.33	13.42
Insiza—				
Albany ...	2.38	2.98	17.77	23.58
Filabusi ...	1.19	2.29	18.31	21.25
Fort Rixon ...	4.12	2.94	20.29	21.88
Inyezi ...	3.02	1.26	18.21	22.52
Lancaster ...	2.52	1.40	16 29	25.11
Scaleby ...	3.21	2.24	17.82	n.s.
Wanezi Mission ...	2.01	1.94	18.71	n.s.
Matobo—				
Bon Accord ...	2.36	0.93	12.01	n.s.
Fort Usher ...	1.63	1.98	16.37	n.s.
Holly's Hope ...	1.43	1.41	13.63	20.88
Longsdale ...	0.91	4.07	20.51	n.s.
Matopo Mission ...	1.84	1.80	18.53	25.03
Mtshabezi Mission ...	1.89	2.02	14.19	21.29
Rhodes Matopo Park ...	1.80	3.34	18.44	22.82
Umzingwane—				
Balla Balla ...	1.37	2.37	18.06	23.70
Essexvale ...	1.26	0.79	20.31	23.90
Hope Fountain ...	2.24	3.34	21.92	25.75

RAINFALL—(*Continued*).

Station.	1930. Feb.	Mar.	Total to end of period.	Normal rainfall to end of period.
Zone C.:				
Charter—				
Bushy Park ...	3.51	2.89	20.18	30.26
Enkeldoorn ...	1.64	6.72	26.51	28.28
Marshbrook ...	1.70	2.80	29.47	29.10
The Range ...	1.07	8.30	29 50	29.93
Vrede ...	4.43	4.16	28.14	31.11
Chilimanzi—				
Beacon Hill ...	2.64	3.33	20.52	31.79
Central Estates ...	1.95	2.80	20.26	31.83
Fourie's Post ...	2.10	4.78	16.68	26.81
Orton's Drift ...	2.17	3.75	22.41	26.13
Sebakwe Post ...	2.38	2.24	20.16	23.75
Umvuma Railway ...	2.35	2.66	19.49	27.54
Gwelo—				
Cross Roads ...	1.63	3.37	17.30	29.22
Delano Estate ...	1.97	2.41	17.75	n.s.
East Clare Ranch ...	3.80	3.21	21.60	32.43
Forestvale ...	3.80	4.57	23.15	n.s.
Globe and Phœnix Mine ...	3.39	3.35	22.72	27.66
Lannes Farm ...	2.26	2.21	18.59	n.s.
Lalapanzi ...	4.47	3.87	21.60	32.55
Lyndene ...	1.38	2.51	21.05	27.14
Woodendhove ...	3.59	1.86	18.34	29.27
Wold Farm ...	4.00	2.32	19.53	n.s.
Hartley—				
Ardgowan ...	2.30	4.11	28.83	30.67
Balwearie ...	8.44	...	...	32.51
Battlefields ...	6.45	5.28	31.73	28.44
Beatrice ...	2.39	2.88	20.07	32.82
Carnock ...	2.08	5.60	31.66	30.33
Cromdale ...	2.80	3.50	27.09	31.66
Currandooley ...	5.45	2.89	25.87	n.s.
Eiffel Blue Mine ...	9.07	2.88	27.18	26.55
Elvington ...	2.13	3.83	28.51	29.78
Gatooma ...	7.52	3.59	26.59	31.14
Cotton Breeding Station ...	7.84	..	...	n.s.
Gowerlands ...	1.75	4.51	26.94	30.19
Handley Cross ...	7.39	6.71	27.08	n.s.
Hartley Gaol ...	4.20	4.13	26.64	31.49
Hopewell ...	2.59	5.78	29.23	31.44
Jenkinstown ...	3.84	5.33	29.31	...
Maida Vale ...	7.46	5.66	25.72	28.07
Meadowlands ...	2.51	2.85	28.75	n.s.
Nyadgori ...	2.02	3.86	26.62	29.50
Pulham ...	2.21	2.05	26.21	32.23
Ranwick ...	4.98	2.39	28.88	32.86
Sunny Bank ...	4.97	3.39	24.77	n.s.
Thorndyke ...	2.59	6.78	26.29	27.96

RAINFALL—(*Continued*).

STATION.	1930. Feb.	Mar.	Total to end of period.	Normal rainfall to end of period.
ZONE C.—(Continued)				
Lomagundi—				
Argyle ...	2.46	3.08	25.18	30.89
Baguta ...	1.08	5.23	27.18	33.09
Between Rivers ...	1.10	5.01	25.54	n.s.
Citrus Estate ...	1.36	4.46	26.28	30.98
Strathdon ...	2.03	4.40	25.66	n.s.
Darwendale ...	2.15	3.57	20.86	29.52
Dedsi ...	1.65	2.56	23.36	29.87
Dingley Dell ...	2.51	2.17	22.22	29.61
Gambuli ...	2.45	4.06	21.75	33.49
Kapiri ...	1.52	1.65	21.30	32.32
Kashao ...	2.56	4.79	25.21	n.s.
Kenidia ...	1.10	3.81	19.58	n.s.
Mafoota ...	0.78	5.04	25.49	29.31
Maningwa ...	4.15	4.37	28.51	31.42
Miami ...	1.82	3.74	20.34	n.s.
Mica Field ...	1.64	6.14	19.38	29.31
Montrose ...	3.37	1.70	26.29	31.03
Mpandegutu ...	1.34	5.52	29.27	31.43
Msina ...	2.28	...	...	n.s.
Mukwe River Ranch ...	2.16	2.95	23.88	29.36
Nyapi ...	1.04	4.15	22.53	30 52
Wari ...	2.87	3.25	21.63	28.71
Nyati ...	2.01	3.45	24.58	...
Palm Tree Farm ...	2.46	3.14	27.49	29.78
Pendennis ...	3.02	4.39	21.51	n.s.
Raffingora ...	...	...	...	28.73
Renardia ...	2.06	5.10	27.15	31.35
Richmond ...	0.89	2.77	20.88	26.53
Robbsdale ...	2.60	4.28	23.81	n.s.
Romsey ...	...	...	...	30.43
Silater Estate ...	1.84	3.49	21.34	32.70
Sinoia ...	1.72	7.20	27.77	30.04
Sipolilo ...	1.09	4.37	25.06	31.30
Umvukwe Ranch ...	0.98	1.99	22.91	31.48
Woodleigh ...	2.67	4.50	29.36	33.98
Yeanling ...	2.25	2.49	23.22	30.03
Zebra Vlei ...	2.49	...	...	28.67
Marandellas—				
Rocky Spruit ...	4.16	4.50	36 56	41.13
Mazoe—				
Pembi Ranch ...	3.40	3.55	26.72	n.s.
Salisbury—				
Agricultural Experiment Station	1.88	3.75	23.96	28.37
Avondale (Broadlands) ...	1.57	3.72	23.86	30.91
Ballineety ...	0.69	4.89	21.45	31.00
Bromley ...	1.86	2.55	30.27	32.36
Cleveland Dam ...	2.92	3.26	26.68	30.65
Forest Nursery ...	2.00	1.86	20.87	31.47
Gwebi ...	1.43	5.08	23.67	31.31

RAINFALL—(*Continued*).

STATION.	1930.		Total to end of period.	Normal rainfall to end of period.
	Feb.	Mar.		
ZONE C.—(Continued)				
Salisbury (continued)—				
Salisbury Agricultural Dept.	1.43	3.75	21.57	29.99
Sebastopol ...	1.63	3.57	24.58	32.10
Stapleford ...	2.80	4.37	22.13	32.67
Tobacco Experiment Station	1.55	3.52	21.77	32.24
Western Commonage ...	1.56	4.17	25.43	28.55
Sebungwe—				
Sikombela ...	3.33	4.32	25.16	31.45
Wolverley ...	2.72	3.38	20.51	26.92
ZONE D. :				
Darwin—				
Cullinan's Ranch ...	2.60	3.66	25.60	27.76
Mount Darwin ...	1.18	4.95	22.38	29.42
Rusambo ...	0.94	...	...	n.s.
Inyanga—				
Inyanga ...	0.95	6.33	26.25	36.04
Juliasdale ...	1.55	10.40	39.52	42.51
Rhodes Estate ...	2.98	9.55	32.85	41.44
Makoni—				
Ardlamont ...	1.37	...	...	n.s.
Eagle's Nest ...	1.18	4.52	29.69	31.83
Mayo Ranch ...	1.40	2.92	22.03	n.s.
Wensleydale ...	2.73	...	...	32.79
Mazoe—				
Argyle Park ...	2.70	5.04	25.81	31.10
Atherstone ...	1.52	4.19	29.72	33.97
Bellevue ...	2.75	5.48	25 78	31.50
Bindura ...	1.56	4.14	22.05	31.66
Ceres ...	0.81	3.65	27.08	35.74
Chipoli ...	0.84	8.23	34.72	31.68
Citrus Estate ...	1.80	2.51	24.23	32.84
Craigengower ...	1.96	4.08	26.43	32.43
Dandejena ...	1.49	...	...	n.s.
Donje ...	3.16	6.39	29.80	n.s.
Frogmore ...	2.90	3.23	28.52	33.22
Glen Divis ...	1.22	2.37	25.10	37.80
Glen Grey ...	1.42	...	...	28.76
Great B ...	5.00	6.55	31.85	33.11
Hinten ...	2.49	...	...	24.56
Horta ...	1.01	4.30	26.42	32.55
Kilmer ...	1.80	4.10	26.64	32.19
Kingston ...	0.92	4.80	29.67	36.14
Maienza ...	0.76	...	...	34.80
Marston Farm ...	1.42	3.67	23.39	n.s.
Mazoe Dam ...	1.23	2.38	23.53	34.23
Mgutu ...	3.15	3.03	22.82	37.38
Muripfumba ...	3.06	4.71	31.83	30.03
Omeath ...	1.39	3.10	27.66	31.49

RAINFALL—*(Continued).*

Station.	1930. Feb.	1930. Mar.	Total to end of period.	Normal rainfall to end of period.
Zone D.—(Continued)				
Mazoe (continued)—				
Pearson Settlement ...	1.75	...	...	33.89
Riversdale Estate ...	1.02	5.64	22.84	29.42
Ruia ...	1.67	5.12	29.21	34.60
Rustington ...	0.20	...	...	30.02
Shamva Mine ...	0.97	5.08	29.57	32.08
Stanley Kop ...	1.77	6.35	29.28	20.93
Sunnyside ...	0.77	5.19	27.06	32.55
Teign ...	1.31	3.99	22.14	32.52
Usk ...	0.82	3.84	31.33	38.83
Virginia ...	0.35	3.20	24.21	31.32
Visa ...	1.87	4.37	28.62	n.s.
Woodlands ...	...	...	...	35.58
Zombi Farm ...	0.99	3.84	28.14	36.47
Mrewa—				
Maryland ...	1.31	8.12	29.24	n.s.
Montclair ...	0.82	5.64	27.24	n.s.
Mrewa ...	2.25	4.14	24.28	33.67
Nyaderi Mission ...	0.66	...	...	28.27
Selous Nek ...	0.75	4.83	26.78	31.95
Mtoko—				
Makaha ...	0.19	10.18	27.75	33.41
Mtoko (N.C.) ...	2.54	4.22	34.41	27.58
Salisbury—				
Arcturus ...	1.47	3.31	25.06	38.28
Chindamora Reserve ...	0.17	0.72	18.69	35.40
Glenara ...	2.77	3.30	22.01	31.99
Goromonzi ...	2.10	4.27	26.13	35.23
Hatcliffe ...	1.34	...	...	33.98
Hillside (Broml[illegible] ...	1.21	4.11	30.35	36.60
Kilmuir ...	1.62	2.40	21.17	39.91
Meadows ...	1.91	4.85	29.78	38.22
Pendennis ...	1.40	2.68	20.68	n.s.
Selby ...	3.45	3.73	24.84	30.36
Springs ...	1.34	...	...	32.72
Teviotdale ...	1.91	4.69	22.39	n.s.
Vainona ...	1.75	2.45	19.37	32.03
Zone E.:				
Belingwe—				
Belingwe (N.C.) ...	0.98	1.08	17.53	21.73
Doro ...	1.39	1.94	21.06	23.14
Shabani ...	0.77	4.14	15.37	24.92
Bikita—				
Angus Ranch ...	1.24	4.83	21.85	21.68
Bikita ...	4.28	11.60	38.36	34.35
Devuli Ranch ...	0.61	7.27	20.33	20.68
Pamushana ...	1.20	...	...	33.11

RAINFALL—*(Continued)*.

Station.	1930. Feb.	1930. Mar.	Total to end of period.	Normal rainfall to end of period.
Zone E.—(Continued)				
Charter—				
Buhera ...	1.20	9.71	25.42	33.45
Chibi—				
Chibi ...	0.87	2.38	19.63	22.77
Lundi ...	1.20	4.57	31.13	24.66
Mpapas ...	3.69	2.54	22.25	22.31
Chilimanzi—				
Allanberry ...	1.33	2.45	21.60	27.97
Driefontein ...	2.31	6.19	18.67	26.19
Felixburg ...	1.86	4.88	19.12	29.16
Grootfontein ...	...	...	...	27.57
Induna Farm ...	1.56	3.12	14.93	31.02
Mtao Forest ...	1.85	6.49	22.91	28.89
Makowries ...	2.92	3.80	20.77	n.s.
Thornhill ...	1.19	2.45	15.04	n.s.
Gutu—				
Alheit Mission ...	0.40	...	...	24.06
Devuli Store ...	0.20	...	...	n.s.
Eastdale Estates ...	1.15	3.65	23.87	33.01
Gutu (N.C.) ...	1.11	1.94	16.35	28.69
Glenary ...	0.68	5.33	20.87	25.75
Gwelo—				
Glencraig ...	2.67	3.56	23.27	31.60
Partridge Farm ...	4.69	4.39	24.81	34.16
Sheep Run Farm ...	1.94	3.16	17.24	28.97
Inyanga—				
St. Trias' Hill ...	1.95	10.26	39.21	37.71
Insiza—				
Roodeheuvel ...	2.80	1.03	19.31	26.71
Stoneham (Brae Valley) ...	3.47	2.32	19.58	n.s.
Makoni—				
Bude ...	...	...	...	n.s.
Craigendoran ...	0.09	3.98	24.33	32.73
Forest Hill ...	1.20	7.21	31.27	34.20
Kairidzi ...	0.87	4.22	29.12	n.s.
Mona ...	2.02	3.66	31.51	36.71
Monte Cassino ...	1.14	4.14	33.12	33.17
Ruati ...	0.73	7.79	28.76	n.s.
Rusape (N.C.) ...	0.78	4.14	30.41	n.s.
Springs ...	1.35	5.18	32.77	32.41
Whitgift ...	0.26	4.17	24.07	n.s.
Marandellas—				
Bonongwe ...	4.55	5.05	34.99	31.64
Delta ...	2.89	3.05	33.18	35.71
Elandslaagte ...	3.96	4.20	31.04	31.72
Lushington ...	3.54	4.10	29.44	n.s.
Macheke ...	1.08	6.43	30.91	32.43
Marandellas (N.C.) ...	3.28	6.42	37.15	34.54

RAINFALL—(*Continued*).

Station.	1930. Feb.	1930. Mar.	Total to end of period.	Normal rainfall to end of period.
Zone E.—(Continued)				
Marandellas (Continued)—				
Marandellas Estate ...	4.50	4.02	35.59	30.17
Nelson ...	2.24	5.76	32.77	29.54
Wedza Reserve ...	3.10	6.29	34.14	n.s.
Wenimbi ...	4.42	...	...	32.85
Melsetter—				
Brackenbury ...	2.58	6.68	35.38	53.05
New Year's Gift ...	0.51	3.78	21.86	n.s.
Sabi Tanganda Estate ...	0.20	1.75	13.95	n.s.
Ndanga—				
Bangala Ranch ...	2.27	...	...	n.s.
Doornfontein ...	0.93	...	...	28.81
Marah Ranch ...	0.65	7.01	23.88	29.54
Triangle Ranch ...	1.11	2.53	19.08	22.77
Zaka ...	1.69	4.38	22.36	n.s.
Selukwe—				
Aberfoyle Ranch ...	1.35	3.17	21.55	29.87
Hillingdon ...	2 27	3.12	21.76	32.70
Impali Source ...	2.26	2.76	19.43	28.55
Rio ...	3.05	3.26	21.89	30.22
Safago ...	2.93	3.89	24.63	32.25
Selukwe ...	5.53	7.23	38.14	40.95
Umtali—				
Argyll ...	0.30	4.94	21.10	32.15
Embeza ...	7.19	10.66	45.97	n.s.
Fairview ...	0.85	7.62	25.30	33.17
Fern Valley ...	0.65	3.12	20.68	...
Jerain ...	0.52	3.72	22.13	30.63
Mountain Home ...	5.53	13.38	46.05	n.s.
Mutambara Mission ...	0.97	2.09	18.08	27.27
Odzani Power Station ...	0.97	11.70	34.38	35.60
Park Farm ...	3.54	6.50	27.31	43.14
Premier Estate ...	0.80	5.99	27.97	30.29
Sarum ...	1.38	7.21	24.43	30.18
Sheba ...	7.40	13.47	60.09	n.s.
Stapleford ...	6.47	9.18	47.03	63.84
St. Augustine's Mission ...	1.92	10.20	34.26	38.91
Transsau Estate ...	...	3.17	17.22	30.49
Umtali Gaol ...	1.71	7.65	28.41	29.59
Victoria—				
Bruceham e ...	2.38	3.42	20.04	26.85
Cambria ...	1.61	3.87	17.46	22.90
Cheveden ...	1.55	8.10	28.43	32.80
Clipsham ...	3.91	4.14	22.94	26.58
Gokomere ...	1.94	3.53	20.04	26.73
Kimberley Ranch ...	1.28	3.41	21.74	n.s.
Mashaba ...	1.15	4.81	22.80	29.34
Miltonia ...	2.70	2.23	17.22	n.s.
Riverdene North ...	1.74	5.46	21.24	25.35

RAINFALL—(*Continued*).

STATION.	1930. Feb.	1930. Mar.	Total to end of period.	Normal rainfall to end of period.
ZONE E.—(Continued)				
Victoria (Continued)—				
Salemore ...	1.34	...	...	...
Silver Oaks ...	1.61	3.48	20.33	27.58
Stanmore ...	1.24	3.95	17.84	24.52
Victoria ...	2.49	2.77	19.03	24.43
Zimbabwe ...	1.61	6.10	24.39	30.03
ZONE F.:				
Melsetter—				
Chikore ...	2.98	8.14	31.19	40.52
Chipinga ...	2.19	8.84	30.68	...
Lettie Swan ...	2.76	9.39	28.27	n.s.
Melsetter ...	3.04	10.58	34.22	42.26
Mount Selinda ...	5.18	11.91	41.80	55.05
Vermont ...	4.59	17.69	46.98	55.76
Umtali—				
Cloudlands ...	5.98	8.71	35.78	n.s.

Salisbury Experiment Station.

FOR SALE.

KUDZU VINE CROWNS.

A limited quantity of kudzu vine crowns are available for sale at the following rates:—

Large crowns	6d. each.
Small crowns	3d. each.

Prices are carriage free to any station or siding in Southern Rhodesia.

Purchasers are recommended not to plant small crowns, except on land which can be irrigated. Orders with remittances should be addressed to the Chief Agriculturist, Department of Agriculture, Salisbury.

Dates of Meetings of Farmers' Associations, Southern Rhodesia.

Name of Association.	Place of Meeting.	Secretary.	May.	June.
			1930	1930
Ayrshire—Sipolilo	Various farms	G. H. Cautherley	10	14
Banket Junction	Banket Hotel	A. M. Hutchinson	2	6
Beatrice District	Farmers' Hall, Beatrice	W. Krienke	29	26
Bindura	Bindura Farmers' Hall	W. E. Fricker	9	13
Bromley	Farmers' Hall, Bromley Siding	E. Taylor	7	4
Bubi	Queen's Mine	W. H. Perham	16	20
BulawayoLandowners'and Farmers' Association	Library Buildings, Bulawayo	T. B. Hepburn	6	3
Chakari	Various farms	Lady Codrington	21	18
Daisyfield	Somabula (May), Daisyfield (June)	L. E. Edwards	10	21
Darwendale—Trelawney	Various farms	Charles H. Tanner	28	25
Eastern Districts	Farmers' Hall, Chidza	W. E. Richards	10	14
Enkeldoorn	Enkeldoorn	C. N. Ludlowe	6	3
Enterprise	Farmers' Hall	W. Stobart	6	3
Essexvale	Essexvale	Col. D. Judson	18	15
Felixburg—Gutu	Glenary (May), Ferndown (June)	E. C. Fleetwood	10	14
Figtree Branch, R.L. and F.A.	Figtree Hotel	The Secretary	6	3
Gadzema	Gadzema Hotel	H. G. M. Liddell	9	13
Gatooma	Speck's Hotel	Col. J. A. Smith	17	21
Gatooma (Golden Valley Branch)	Golden Valley Hotel	C. K. James	10	14
Gazaland (South Melsetter)	Farmers' Hall, Chipinga	J. Ward	17	21
Greystone	Quarrie Farm	P. J. van der Walt	10	...
Gwanda	Lowenthal's Building, Gwanda	N. J. B. Nilson	17	21
Hartley	Hartley Hotel	Mrs. F. C. Watson	10	14
Headlands	Headlands	J. A. Eve	...	...
Hunter's Road	Hunter's Road	R. W. Twilley	31	28
Insiza South	Farm Lancaster	J. Campbell	...	12
Inyazura	Inyazura	W. P. Frudd	...	6
Lalapansi	Lalapansi	B. J. Ingle	10	14
Lomagundi	Sinoia	F. W. Robertson	...	...
Lomagundi West	Various farms	A. A. Bisset	11	8
Macheke	Various farms	R. O. Jackson	...	...

Macheke Valley (Headlands) Farmers' and Tobacco Growers' Association	Various Farms	T. R. Colam	3	7
Makwiro	Makwiro	W. L. Parsons	16	20
Marandellas	Marandellas Farmers' Hall	E. Cruikshank	2	6
Marandellas, Southern	Various farms	B. V. Cherry	7	4
Mashonaland	Mashonaland Farmers' Hall, Salisbury	P. Wilson	9	13
Matobo South	Farmers' Hall, Malundi Farm	A. G. Allan	17	21
Matopo Branch, R.L. and F.A.	Farmers' Hall, Malundi	W. Mirtle	17	21
Mazoe (Concession)	Various farms	Douglas Southey	9	13
Mazoe (Glendale)	Farmers' Hall, Glendale	James S. Brown	14	11
Melsetter	Court House, Melsetter	J. C. Kruger	8	12
Midlands Farmers and Stockowners	Royal Hotel, Gwelo	T. R. van Rooyen	14	11
Ngezi-Umniati	Harvieston, Enkeldoorn	Miss Harvie	31	28
North Melsetter	Various farms	P. F. de Bruyn	...	14
North Umniati	———	J. F. Eagar	Not	received
Norton and Lydiate District	Norton	A. Jones	2	6
Nyamandhlovu	Nyamandhlovu	R. D. McLean	...	...
Odzi District Farmers	Odzi Hotel	M. Goldberg	3	7
Poorte Valley	Various places	A. D. Wilson	17	21
Que Que	Offices of the Que Que Sanitary Board	A. A. Ackerman	17	21
Rusape Farmers' Association	Rusape	E. C. Harrington	3	7
Salisbury South	Various farms	P. Linton	28	25
Shamva	Shamva Court House	L. H. S. Paxton	16	20
Shamva North	Various farms	Mrs. E. J. Stevenson	17	21
Two Rivers Farming Association	Various farms	W. L. Parsons	17	21
Umboe (Branch of Lomagundi F.A.)	Various farms	G. T. Gover	10	14
Umvukwe Farmers' and Tobacco Growers' Association	Various ranches	———	10	14
Umtali	Drill Hall, Umtali	A. Howat	1	5
Umvuma and District	Court House, Umvuma	S. T. Montgomery	16	20
Victoria	Victoria	G. E. Lamb	3	7
Wankie District	———	F. H. Going	Not	received
West Umvukwe Farmers' Association	Various farms	G. H. Gordon	3	7
Western	Plumtree Hotel	The Secretary	10	14
Willoughbys	Willoughbys	A. E. Roberts	Not	received

Export of Cattle from Southern Rhodesia, 1930.

Month	Union		Eng-land.	Congo		N. Rhodesia.		Portuguese East Africa.		Total
	Slaughter		Slaugh-ter							
	Johannes-burg	I.C.S. for overseas	On hoof	Slaughter	Breeding	Slaughter	Breeding	Slaughter	Breeding	
January ...	...	...	...	2,449	67	...	...	...	...	2,516
February ...	...	...	...	3,438	8	537	91	...	11	4,085
March ...	25	...	160	1,097	...	249	...	...	7	1,538
April ...										
May ...										
June ...										
July ...										
August ...										
September ...										
October ...										
November ...										
December ...										
	...	...	...	...	...	...	...	...	...	...

Farming Calendar.

May.

BEE-KEEPING.

Last month under normal conditions should have seen the last honey flow of the season almost ready for robbing, for which purpose have the extractor overhauled, spare crates available, bee escape boards ready, honey jars and bottles ready for usage, and also have a few spare quilts on hand. Do not rob the bees of too much honey, remembering that sending them into winter quarters with a sufficiency of food means a strong issuing colony in the spring. Any new swarms that it may be decided to add to the apiary, feed well if necessary, to induce stimulative breeding while there is time, or if new young queens have replaced older ones also feed liberally this month in the proportion of one part of cane sugar to two of water; for the somewhat wild Rhodesian bee there is nothing like the Alexander feeder let in from the back. Keep all the spaces under hive stands clean, also inspect daily to see that white ants are not building up from the soil; if this is neglected much loss may follow. When seen, sprinkle diluted kerol from a watering can under the hive stand.

Granulation in the bottled honey can be prevented by first ripening the extracted honey in large tins covered with butter muslin for three or four days by exposure to the sun's rays. It should then be heated to a temperature of 150-160 degrees—nothing higher. As soon as this is reached withdraw the tins and bottle when cooling. The best way to obtain this heating is to place the tins in another receptacle of cold water and boil it up to the required heat, as heating it direct over a fire is very liable to burn the contents or to impair the delicate flavour of the natural honey.

CITRUS FRUITS.

The harvesting of the early ripening fruit should be commenced about the first week in May. Exporters should cure their Washington Navels for a longer period than usual; this will enable them to detect the thick skinned fruit easily. Where necessary, irrigation should be continued up to within ten days of harvesting. All ploughing and cultivation should be completed without delay.

CROPS.

Continue to cut and stook maize as it matures; make the stooks small to assist drying. Later in the season the stooks may be made larger. See that the stooks are secure and pick up plants lying on the ground. Continue to plough up land between stooks of maize. Give all maize harvested, whether husked or in the husk, a chance to dry out before riding to the dumps. Do not begin shelling if the ears are still damp. Do not use new grain bags for harvesting maize. Make the dumps of unhusked ears as small as possible; the smaller the dump the quicker the grain will dry out. Grain on the cobs dries extremely slowly, if at all, in dumps of large size. Do not mix unhusked ears from the stooks with dryer ears harvested later from the standing crop. Keep the dryer ears in a separate dump;

shell, bag and stack such maize separately. When cutting maize for stooking, insist on the stalks being cut within 2 to 4 inches of ground level. The plough, in Rhodesia, will not bury roots with stalks 8 to 12 inches high. A long stubble of stalks makes clearing of the ground for ploughing very tedious and expensive. If not already harvested, ground nuts should be lifted before the first frosts damage the hay. Finish transplanting onions from seed-beds. If plants are not flourishing after transplanting, give a light dressing of nitrate of soda—50 lbs. per acre. Repeat in a fortnight if needed. Sow most winter cereals on wet vleis or under irrigation early this month. Feed your sweet potato vines to stock; if frosts occur the vines will be killed. Dig and feed tubers from end of month onwards. Towards end of month harvest cattle pumpkins and melons and handle carefully; avoid bruising to prevent rotting. Place pumpkins and melons in a dry situation in the open and in a single layer. Supply plenty of roughage to cattle pens, kraals and stables to increase the manure supply. Collect and cart manure to lands for spreading. Do not attempt to plough in dry grass or quantities of maize refuse. The plough will not turn it under and it will not rot before next planting season. Burn such refuse and make a good job of the ploughing. If the weather seems set fair, commence brick-making. A small kiln of bricks always on hand is most useful. As labour permits, re-thatch buildings and outhouses in need of repair. Overhaul, grease and paint planters, drills and other implements not required again until next season, and store away under cover. Think about your fertiliser requirements for next season and place your orders. From now onwards the second ploughing of new land broken up earlier in the season should be pushed on with as opportunity offers.

DECIDUOUS FRUITS.

The pruning of early ripening peaches should be performed this month. All holes should be completed and kept in readiness for June planting. Ploughing or digging and cultivation should be completed without delay.

ENTOMOLOGICAL.

Cabbage Family.—Plants of this family are liable to suffer greatly from cabbage louse and Bagrada bug during May. For the former, spray with soap and tobacco wash, which may help if the plants are not too big.

Dhal.—Blister beetles are still injurious to the blossom of the crop, and should be regularly collected and destroyed.

Citrus Trees.—Continue to collect and destroy all fruits infested with citrus codling.

Guava.—Fruit fly and citrus codling breed in these fruits during the autumn and winter.

Tobacco.—Watch should be kept for emergence of the adult wireworm beetle. These should be poisoned with Paris green in the proportion of 1 lb. to 200 lbs. of maize meal. The bait should be spread on the land in small heaps early in the morning, and shaded from the sun.

FLOWER GARDEN.

The month of May is a suitable one for the preparation of new flower beds. The ground should be well trenched, and if of poor quality, a light dressing of well rotted manure will be a distinct advantage. Too heavy dressing is not advised, as too rich a soil is likely to produce an abundance of foliage and very few flowers. It is not too late to sow sweet pea seeds, but the best results come from early planting. By this time all bulbs for spring flowering will be planted. Chrysanthemums, delphiniums, dahlias and other herbaceous perennials may now be cut down, and if necessary taken up, divided and replanted

VEGETABLE GARDEN.

It will be necessary during the early part of the month to clear off what remains of summer crops, such as haricot beans, peas, cucumbers,

etc. Where winter deep rooting vegetables are to be grown, such as carrots, parsnips and beets, the soil and sub-soil should be deeply worked, so as to allow a ready root run for these vegetables. A dressing of lime will be of great value in every section of the kitchen garden. This will especially help to minimise future attacks of insects and fungus attacks. New asparagus beds may be made this month; old beds should be cut down, cleaned and kept in good order; also a light dressing of stable manure may be given to the beds. Planting may be made of all seedlings, such as cabbage, cauliflower, lettuce, onions, etc., and seeds of carrot, leek, lettuce, onions, peas, radish, turnip, parsnip, broad beans may be sown.

FORESTRY.

Continue pricking out seedlings into tins. Deciduous trees which are propagated by means of cuttings should be taken in hand. See that the fire lines are in order, and in the case of woods which have formed canopy, remove inflammable material below the edge trees.

POULTRY.

All cockerel chickens should be separated from the pullets, and every month gone over carefully, the poorer ones eliminated and only the very best kept. Those cockerels with the deep long bodies, short legs and round heads should be kept. Those with any inclination to long legs, knock knees, long heads or thin beak, lop-over combs, narrow bodies, or those lacking length and depth should be rigorously discarded. The chickens must not be allowed to become chilled, especially at night; on the other hand, they must not sleep in a hot stuffy atmosphere. On no account must they be overcrowded; this is fatal and is one of the many rocks on which poultry keepers come to grief.

The young stock must have all they can eat; to stint them is to ruin them for good and all. A bird that has been stunted never recovers. Remember that they require food for heat, energy, repair of wear and tear, and to produce bone, fat, flesh, tissue, blood and feathers. A good quality bone meal (lime phosphate) is absolutely necessary, as is also plenty of succulent green food, and no animal protein is better than thick separated milk for the health and growth of the chickens.

Those going in for ducks should hatch according to the numbers they have to supply for eating each week. Ducks must have all the food they will eat from the time they are hatched. A quick-growing duck should put on 1 lb. per week and be ready for killing at from seven to eight weeks old. Always kill or sell for killing just before the large wing feathers commence to grow.

If the rains have stopped, turkeys can be hatched. See that the youngsters are kept warm, but also that they have plenty of fresh air. Never feed young turkeys on wet or moist food, but give dry mash, grain, plenty of onion tops or onions chopped small, and thick separated milk. Keep them free from insect vermin; they will never thrive if they are infested with these.

Never allow the hen that has hatched the turkey eggs to run with the youngsters. Always confine her in a coop, through the slats of which the young turkeys can run in and out. The coop should be moved to fresh ground each day; nothing is worse for young turkeys than to be running on the same piece of ground for long at a time. Tainted ground is one of the chief causes of mortality among young turkeys.

STOCK.

Cattle.—Ranching cattle may still be expected to be in good condition. In most districts it will be wise to conserve hay, maize stover, ensilage and a supply of any other cheap feed as a provision against possible late rains in the spring, and to enable one to maintain the younger or very old stock should occasion arise. By the middle of this month dairy

cattle will require more serious attention in the matter of feed. Grass should be cut for bedding and both cows and calves should be well bedded down at night from now onwards, and cowsheds should be put in good repair. Attention should be given to the water supplies and care taken that they are clean and sufficient.

Sheep.—If the vleis have dried, sheep may be allowed into the lower lying veld. If the rams are put in now, lambs will arrive in October, which is usually a good month to arrange for. Those who favour winter lambs and have ewes lambing now will find a few handfuls of maize, together with chopped maize stalks or any other kind of available roughage or green stuff, a great help to the ewes in providing milk.

TOBACCO.

Curing should be completed as early in the month as possible to prevent loss from frost. The bales of tobacco should be examined and turned weekly until they are despatched from the farm. All bulks must be inspected regularly and turned if necessary. Tobacco seed should be shelled as soon as the seed pods are dry and the seed carefully labelled and stored in a dry place. The stumping, clearing and ploughing of new land, if operations have not already been commenced, should be no longer delayed. Land which has just produced a crop should be ploughed and harrowed as soon after the harvest as possible.

VETERINARY.

Horse-sickness will still be in evidence, and may be expected to continue until the frosts occur. Inoculation for blue tongue should be performed in the dry season only, unless the animals can be kept under cover for 21 days. Do not inoculate ewes in lamb on account of abortion. Inoculated animals spread the disease for 21 days. Scab is a poverty winter disease.

WEATHER.

During the major portion of this month the ordinary winter conditions prevail, viz., cloudless sunny days and cold nights. Frost may be normally expected at any time during the latter half of the month. There is often, however, a recrudescence of rain conditions during the early portion of the month, resulting in overcast days and light drizzling showers, the normal rainfall at many places, particularly in the southern and eastern portions of the country, amounting to over half an inch.

June

BEE-KEEPING.

At this season hives require to be painted; the woodwork, being exceedingly dry, is in good condition to receive it. Linseed oil (unboiled) is the best kind to mix with white lead, as it is more penetrating, acting as a better preservative than boiled oil. Bees will be able to take beneficial flights during warm days, so that dysentery need not be anticipated.

CITRUS FRUITS.

Cultivation of the grove is to be continued. Early ripening fruit must be harvested and marketed without delay. Mid-season varieties will be fit for packing early in the month. These should be shipped as early as possible, so as to extend the late variety export season as much as possible. Most late ripening varieties will require irrigating during the month.

A small amount of pruning should be done. If fumigation is to take place, remove the small branches that touch the ground, cut out all dead wood and water shoots.

COTTON.

In cleaning up the cotton fields care will have to be exercised in the supervision of the pickers. The cotton harvested at this period of the season generally comes from late bolls naturally matured and those prematurely opened by the cold weather and frost. The matured seed cotton should be kept entirely separate from the immature seed cotton. There will also be some dirty and stained cotton in this final picking. Arrangements for next season's seed requirements should receive consideration.

CROPS.

Select seed from the very best of your own crops. It is always wise to keep more seed than you may need for planting. Do not shell and ride your maize to the railway unless it is fit for export or market. If in doubt regarding the moisture content of the maize, send a 2 lb. sample in an air-tight tin, such as a golden syrup tin, to the Agricultural Department and have it tested. Provide ample dunnage for your maize stacked at the railway or on the farm. Use maize cobs; husks are almost useless for this purpose. Sew your bags of maize according to the export regulations and stack them properly at the railway side, leaving plenty of room between the double rows. Select pumpkin and melon seed from the best specimens. Support your agricultural show and make it a success by preparing and entering as many exhibits as you can. No one is more to blame for a poor show than the farmers themselves. Make a list of the seed requirements for next season, and where purchases must be made, place the orders early.

Veld fires must be anticipated, and if not already attended to, the mowing or burning of fire-guards, both boundary and internal, should be proceeded with.

DAIRYING.

At this time of the year the farmer should experience very little difficulty in producing cream of first-grade quality. During the winter months the separator should be adjusted so as to deliver cream testing 40 to 45 per cent. butter fat.

On exceptionally cold days care should be taken that the milk is not allowed to become too cold before separation—for efficient skimming, the milk should be separated immediately after milking and at a temperature not lower than 90 degrees F.

Farmers engaged in butter-making are usually successful in obtaining a good grain and firm body in butter at this season of the year. During cold weather it is frequently necessary to warm the cream for churning. The most satisfactory method of warming the cream to the proper churning temperature is to place the bucket or receptacle containing the cream in a tub or bath of water at a temperature of about 95 degrees F., stir the cream frequently and replace the water when cold.

Under the cool conditions which obtain from this time of the year onwards, cheese-making operations are usually most successful.

Care should always be exercised, however, in using evening's milk. If the milk is over-acid it should not be used, or a hard, dry cheese will result. Morning's milk plus a starter usually gives the best quality of cheese. The starter should have a clean sour taste and smell. In early winter, milk for cheese-making frequently contains a high percentage of fat, and in order to firm the curd properly in the whey it is usually necessary to raise the scalding temperature a few degrees.

At this period of the year winter feeding of dairy stock should commence in real earnest. The milking cows should now be in fairly good

condition, and in order to maintain a full flow of milk throughout the cold, dry months of winter, it is essential that liberal feeding be practised. As far as possible an attempt should be made to imitate summer conditions by feeding an abundance of succulent and palatable food. Maize silage, sweet potatoes, pumpkins, etc., are very useful for this purpose, but these feeds should be supplemented by dry roughage of good quality, preferably a legume hay, and a liberal allowance of mixed concentrates.

For dairy heifers, weaned calves, etc., there is possibly no better ration than one consisting of maize silage, legume hay and mixed concentrates, and these feeds, if supplied in liberal quantities, should serve to keep the young stock in a thrifty, growing condition.

DECIDUOUS FRUITS.

General pruning may be done this month if the leaves have fallen. This should be confined, as far as possible, to the thinning out of diseased, weak, broken and dead shoots.

Tall trees may be reduced in height, and old and unprofitable trees headed back to induce the growth of new fruiting wood.

Trees that shed their leaves late may be pruned in July. The necessary preparations for planting trees should be completed during the month and planting commenced towards the end of the month.

Cultivation should be continued.

ENTOMOLOGICAL.

Cabbage Family.—Plants of this family suffer from cabbage louse and Bagrada bug during June.

Onions.—Suffer from thrip. The transplants may be dipped as far as the roots in tobacco wash or paraffin emulsion to keep down the pest.

Fig.—The winter crop of fruit is liable to suffer from fig weevil. The infested fruit should be collected and destroyed. If this has been done regularly with the first crop, the second crop is not likely to suffer much.

FLOWER GARDEN.

Annuals for early spring flowering should be sown, preferably in paraffin tins cut lengthwise, in a place sheltered from the wind. Perennials, shrubs and ornamental tree seeds may also be sown. Fruit trees, shrubs and roses should be pruned and all dead wood removed. Sweet peas require constant attention.

VEGETABLE GARDEN.

All the available space in the garden should now be thoroughly trenched and manured, the soil being well worked and loosened. Vegetables planted out for winter crops should be well and continuously cultivated, which will help to bring them along quicker and with less watering. Late-bearing tomatoes should be sheltered from the cold winds by a grass shield. Beet, radish, carrot, parsnip, turnip, onion, leek, mustard, cress and tomatoes may be planted.

FORESTRY.

Care should be taken by further ploughing of land or burning of grass that all fireguards round plantations are in good order and effective. Thinnings where necessary may be continued, and fellings which are to be made are to be carried out. Cuttings may be taken and struck now of deciduous trees, such as the Carolina poplar. The pricking out of conifer seedlings into tins should be continued, and sowing of such seed for the coming planting season may be completed. A commencement may be made of preparation of land to be planted during the ensuing season, e.g., by stumping if necessary, and ploughing where practicable.

GENERAL.

Grazing is deteriorating, and the next few months may be a period of difficulty for the rancher. It is a mistake, frequently seen, for all the grazing nearest to the drinking places to be first consumed, so that later on the cattle, when least able to endure fatigue and when the grass is in any case most scanty and dry, have furthest to walk from the feeding ground to water. A little forethought can obviate this trouble. Live stock are usually in good condition at this time of year and able to travel longer distances to water than may be the case later on in the season. Fire guards to prevent grass fires should be looked to.

POULTRY.

The poultry keeper must be on the look-out for sudden cold snaps, for if some precautions are not taken, the production of eggs will drop. Iron houses without a good thick layer of grass on the top and round the sides are very cold at night for the birds, and not only will the egg output drop, but the birds will very likely contract congestion of the lungs, bronchitis or pneumonia.

Cold weather, too, is likely to affect the breeding stock and cause infertile eggs. A little extra crushed mealies added to the evening feed on cold days, or a little barley softened with hot water, will keep up the body heat of the birds.

This is one of the poultry keeper's busiest periods, but method, cleanliness and attention to details pay him well. Do not leave anything that you can spare the time to do yourself to natives. Watch carefully your breeding birds, and on the slightest sign of one going off, take him or her away; if left, you will have infertile eggs, weak germs, weak chicks difficult to rear, and later weak and unprofitable stock. See that the male bird has all the food he requires, and give him a meal by himself twice a week, also a small piece of raw meat three times a week. Those who are using incubators should watch the temperature of the room on cold nights, for variations in temperature result in delayed and poor hatches, and often deformed chicks.

STOCK.

Cattle.—Where it is necessary to move cattle to fresh pasturage, this should not be unduly delayed. Cows with autumn calves should be kept in the more sheltered paddocks. A watchful eye should be kept on all watering places in order to prevent their being fouled or stopped up. Bulls should be kept out of the herd until the end of July at least, and, in the meantime, they should be well fed and cared for in order to fit them for their work. The three watchwords in the dairy herd should be feed, shelter and bedding from now onwards. Ensilage will now be found invaluable, as also will pumpkins, majordas or any other form of succulent food. Good hay should be used to rack up with at night, and the maize ration should be supplemented with ground nuts, ground nut cake or bean meal. Young calves are better in the pens on very cold mornings until the sun has gained some power, when they may run on short sweet veld for a few hours. The above remarks with regard to dipping and water supply apply equally to dairy as to ranching herds.

Sheep.—Sheep are best kept on the high veld for a while longer. If grass seeds are troublesome, a grazing area should be mown. If the rams were put into the flock in May, they should now be removed. Ewes with lambs will benefit by a few handfuls of mealies, and perhaps ensilage. They should be provided with shelter from cold winds.

TOBACCO.

The grading of tobacco should be proceeded with. Any bales stored on the farm should be turned occasionally, especially where more than one bale is placed on another. Arrangements for the grading of tobacco seed should be made for the coming season. Growers purchasing tobacco seed should place orders early with distributors of reliable seed.

VETERINARY.

Horse-sickness should be practically over now. Redwater and gall-sickness occur all the year round, but the worst time is the summer, when ticks are prevalent. Blue tongue should be very little in evidence now. Inoculation can be carried out now. Scab is a poverty winter disease.

WEATHER.

Casual rains may occur, but except on the eastern frontier, none is to be reckoned upon, nor can it be regarded as seasonable or desirable. Frosts generally occur on a few nights during the month of June, and precautions must therefore be taken. This month and the next are the coldest of the year, and when the cold is accompanied by dull weather or "Scotch mist," known locally as "guti," it is apt to have a severe effect on live stock, especially if grazing should at the same time be scarce and water supplies far to travel to.

Notes from the "Gazette."

"Gazette" Date.	*Items.*
	POUNDS.
	Pounds have been established on the Shiota Reserve, Marandellas native district, and on the Native Reserve at Goromonzi, each to be available from 1st May.
	AFRICAN COAST FEVER.
18.4.30.	His Excellency the Governor-in-Council has been pleased, under the provisions of the "Animals Diseases Consolidation Ordinance, 1904," to cancel Government Notice No. 645 of 1929, and to declare, in terms of section 15 of Government Notice No. 641 of 1927, the following area of infection and guard area in lieu thereof:—
	MELSETTER NATIVE DISTRICT.
	Area of Infection.
	The farms Groenvlei, Morgenson, Enhoek, Canterbury, Avontuur, Hofstede, Hartebeest Nek, Wolfscrag and Schaapplaats.
	Guard Area.
	An area bounded by and including the farms Wolverhampton, Vermont, Randfontein, Nooitgedacht, Newcastle, Vleiplaats, Woodlands, Whittington, Chipinga Commonage, Kenilworth and all sub-divisions thereof, Heilrand, Woodstock, Ravenswood and Helvetia. (G.N. 262.)
18.4.30.	His Excellency the Governor-in-Council has been pleased, under the provisions of the "Animals Diseases Consolidation Ordinance, 1904," to declare, in terms of section 15 of Govern-

"*Gazette*" *Date.*	*Items.*
	ment Notice No. 641 of 1927, the following area of infection and guard area:—

NATIVE DISTRICT OF GWANDA.

Area of Infection.

The farm Deneys.

Guard Area.

An area bounded by and including the farms Spitzkop, Doelfontein, the fenced-off portion of Thornwood Block, Timber, Sablevale and southern half of Hampden Place which is subdivided into plots. (G.N. 264.)

Departmental Bulletins.

The following Bulletins, consisting of reprints of articles which have appeared in this Journal, are available for distribution free of charge to applicants in Southern Rhodesia only. Outside Southern Rhodesia, 3d. per copy.

AGRICULTURE AND CROPS.

No. 174. Notes on Hop Growing, by H. G. Mundy, F.L.S.
No. 218. Useful Measurements for Maize, by J. A. T. Walters, B.A.
No. 225. Napier Fodder or Elephant Grass, by J. A. T. Walters, B.A.
No. 278. New Crops for Rhodesia, by J. A. T. Walters, B.A.
No. 362. The Cultivation of Rice, by H. G. Mundy, F.L.S.
No. 374. Fibre Crops, by J. A. T. Walters, B.A.
No. 403. Florida Beggar Weed, by H. G. Mundy, F.L.S.
No. 429. Propagation of Kudzu Vine, by H. C. Arnold.
No. 442. Swamp or Irrigation Rice, by K. V. Yoshi, Bombay.
No. 510. Check-row Planting of Maize, by H. G. Mundy, F.L.S.
No. 513. The Carob Bean in Rhodesia, by J. A. T. Walters, B.A.
No. 541. The Potato Crop under Irrigation, by G. R. Syfret.
No. 545. Artificial or Synthetic Farmyard Manure, by H. G. Mundy, Dip.Agric., F.L.S.
No. 550. Onion Growing under Irrigation, by C. Mainwaring.
No. 561. Wheat Growing in Rhodesia, by C. Mainwaring.
No. 568. The Treatment of Arable Land, by G. N. Blackshaw, O.B.E., B.Sc., F.I.C.
No. 581. Leguminous Crops for Stock and Soil Improvement in Southern Rhodesia, by C. Mainwaring, Agriculturist.
No. 590. Rye, by H. W. Hilliard, Junior Agriculturist.
No. 591. Maize Export Conference Proceedings.
No. 598. Drought-resistant and Early-maturing Crops for Areas of Late Rainfall, by C. Mainwaring.
No. 599. Rhodesian Soils and their Treatment, by E. V. Flack.
No. 601. Maize for Export, by S. D. Timson.
No. 603. The Production of Maize in Southern Rhodesia, by C. Mainwaring, Agriculturist.
No. 627. The Growing of Potatoes in Southern Rhodesia (Revised), by C. Mainwaring, Agriculturist.
No. 630. The Storage of Seed Potatoes, by H. C. Arnold.
No. 634. Barley, by P. V. Samuels.
No. 643. Noxious Weeds in Southern Rhodesia, by F. Eyles, Botanist.
No. 650. Coffee Culture in Southern Rhodesia, by G. W. Marshall, Horticulturist.
No. 651. Two Important Leguminous Crops: The Velvet Bean and Dolichos Bean, by C. Mainwaring, Agriculturist.
No. 656. Tractor Notes, by A. W. V. Crawley, M.E., F.G.S.
No. 657. Hay-making in Southern Rhodesia, by C. Mainwaring, Agriculturist.
No. 663. The Use of Fertilisers and Manures in Southern Rhodesia, by A. D. Husband, A.I.C., Chief Chemist.
No. 672. Hay-making in Rhodesia, by H. G. Mundy, Dip.Agric., F.L.S.
No. 674. Top Dressing of Maize against Stalk Borer, by H. C. Arnold.
No. 681. The Sunflower (Helianthus Annuus) (Revised), by S. D. Timson, M.C., Dip.Agric.

No. 684. Warning to Maize Growers: Maize for Export.
No. 685. Notes on Farm Practices at the Government Farm, Gwebi, by S. D. Timson, M.C., Dip.Agric.
No. 694. The Edible Canna (Canna Edulis), by D. E. McLoughlin.
No. 695. The Castor Oil Plant (Ricinus spp.), by S. D. Timson, M.C., Dip.Agric.
No. 697. Results of Analysis of Samples taken under the "Fertilisers, Farm Foods, Seeds and Pest Remedies Orrdinance" during the year 1927-28.
No. 700. Further Notes on Farm Practice at the Government Farm, Gwebi, by S. D. Timson, M.C., Dip.Agric.
No. 704. The Importance of Research on Pasture Improvement in Southern Rhodesia, by A. D. Husband, A.I.C., Chief Chemist.
No. 705. Suggested Cropping Programmes for Farms on the Sand Veld, by D. E. McLoughlin, Assistant Agriculturist.
No. 706. A Farmers' Calendar of Crop Sowings, by C. Mainwaring, Agriculturist.
No. 708. Witch Weed or Rooibloem (Striga Lutea)—a Serious Menace to Maize, by J. A. T. Walters, B.A., F.R.S.A., Agriculturist.
No. 709. Sand Veld Farming and its Possibilities, by E. D. Alvord, M.Sc. (Agr.).
No. 710. Monthly Reminders for the Farming Year, by the Division of the Chief Agriculturist.
No. 713. Ensilage, by J. A. T. Walters, B.A., Agriculturist.
No. 724. Ploughing by Tractor, by A. W. V. Crawley, M.E., F.G.S.
No. 727. Farmyard Manure, by A. P. Taylor, M.A., B.Sc., Agricultural Chemist.
No. 743. Sunn Hemp, by S. D. Timson, M.C., Dip.Agric.
No. 750. Cotton in Southern Rhodesia—Hints to Growers, by G. S. Cameron, Empire Cotton Growing Corporation.
No. 751. The Sweet Potato, by S. D. Timson, M.C., Dip.Agric. (Wye).
No. 757. Maize on the Sand Veld: Results at the Tobacco Experiment Station, Salisbury, by C. A. Kelsey-Harvey, Manager.
No. 758. Instructions for Taking Soil Samples. Issued by the Division of Chemistry.
No. 759. Witch Weed (Striga Lutea): Methods of Control, by S. D. Timson, M.C., Dip.Agric. (Wye).
No. 762. The Value of Rock Phosphate and "Bone and Superphosphate" as Fertilisers for Maize Production, by A. D. Husband, Chief Chemist.
No. 768. The Ground Nut (*Arachis hypogaea*), by S. D. Timson, M.C., Dip.Agric. (Wye).
No. 775. Agricultural Costings at the Gwebi Farm, by H. G. Mundy, Dip.Agric., F.L.S., Chief Agriculturist, and J. Hick, Accountant.
No. 776. Regulations Governing the Export of Maize and Maize Meal through the Port of Beira.
No. 777. Some Aspects of Cost of Production Studies in Agriculture, by Arthur G. Ruston, D.Sc., Department of Agriculture, Leeds University.
No. 781. Agricultural Costings at the Gwebi Farm—Maize and Green Manuring, by H. G. Mundy, Dip.Agric., F.L.S., Chief Agriculturist, and J. Hick, Accountant.
Botanical Specimens for Identification.
Maize Grading Regulations.
Accelerating the Sprouting of Potatoes.

REPORTS ON CROP EXPERIMENTS.

No. 94. Second Report on Experiments, by J. H. Hampton.
No. 216. Manuring of Maize on Government Experiment Farm, Gwebi, by A. G. Holborow, F.I.C.
No. 220. Reports on Crop Experiments, Gwebi, 1914-15, by E. A. Nobbs, Ph.D., B.Sc.
No. 221. Results of Experiments, Longila, 1914-15, by J. Muirhead.

No. 239. Reports on Crop Experiments, Gwebi, 1915-16, by E. A. Nobbs, Ph.D., B.Sc.
No. 246. Reports on Crop Experiments, Gwebi, 1915-16, Part II., by E. A. Nobbs, Ph.D., B.Sc.
No. 268. Manuring Maize, Government Farm, Gwebi, by A. G. Holborow, F.I.C.
No. 279. Report on Crop Experiments, Gwebi, 1916-17, by E. A. Nobbs, Ph.D., B.Sc.
No. 341. Report on Crop Experiments, 1918-19, Gwebi Experiment Farm.
No. 342. Rotation Experiments, 1913-19, by H. G. Mundy, F.L.S., and J. A. T. Walters, B.A.
No. 382. Annual Report of Experiments, Experiment Station, Salisbury, 1919-20.
No. 405. Annual Report of Crop Experiments, 1920-21, Gwebi Experiment Farm, by H. G. Mundy, F.L.S., and J. H. Hampton.
No. 411. Annual Report of Experiments, 1920-21, Experiment Station, Salisbury, by H. G. Mundy. F.L.S.
No. 413. Arlington Sand Veld Experiment Station, First Report, by H. G. Mundy, F.L.S., and E. E. Wright.
No. 432. Bulawayo Municipal Experiment Station, First Report, by H. G. Mundy, F.L.S.
No. 433. Winter Cereal Experiments, 1921, by D. E. McLoughlin.
No. 437. Annual Report of Crop Experiments, Gwebi Experiment Farm, 1921-22, by H. G. Mundy, F.L.S.
No. 440. Annual Report of Experiments, 1921-22, Experiment Station, Salisbury, by H. G. Mundy, F.L.S.
No. 485. Annual Report of Experiments, 1922-23, Agricultural Experiment Station, Salisbury, by J. A. T. Walters, B.A.
No. 486. Bulawayo Experiment Station, Annual Report for Season 1922-23, by H. G. Mundy, F.L.S.
No. 514. Bulawayo Experiment Station Report, 1923-24, by H. G. Mundy, F.L.S.
No. 519. Annual Report of Experiments, 1923-24, Agricultural Experiment Station, Salisbury, by H. G. Mundy, Dip.Agric., F.L.S.
No. 537. Crop Rotations on the Gwebi Experiment Farm, 1923-24, by H. G. Mundy, Dip.Agric., F.L.S.
No. 564. A Maize Rotation Experiment, by A. R. Morkel.
No. 566. Bulawayo Experiment Station, Annual Report for Year 1924-25, by H. G. Mundy, Dip.Agric., F.L.S.
No. 608. Annual Report of Experiments, 1924-25, Agricultural Experiment Station, Salisbury, by H. G. Mundy, Dip.Agric., F.L.S.
No. 631. Bulawayo Experiment Station: Annual Report for Year 1925-26, by H. W. Hilliard.
No. 649. Annual Report of Experiments, 1925-26, Agricultural Experiment Station, Salisbury, by H. C. Arnold, Manager.
No. 675. Bulawayo Experiment Station—Annual Report for Year 1926-27, by D. E. McLoughlin.
No. 683. Annual Report of Experiments, 1926-27, Agricultural Experiment Station, Salisbury, by H. C. Arnold, Station Manager.
No. 688. Report, 1923-24—1926-27, Gwelo Municipal Demonstration Stations, by D. E. McLoughlin.
No. 716. Report, 1927-28, Gwelo Municipality Demonstration Stations, by S. D. Timson, M.C., Dip.Agric.
No. 745. Salisbury Agricultural Experiment Station Annual Report, 1927-28, by H. C. Arnold.
No. 767. Gwelo Municipal Demonstration Stations. Annual Report for the Season 1928-29, by D. E. McLoughlin.
No. 773. Bulawayo Municipal Demonstration Station: Report for the Seasons 1927-28 and 1928-29, by D. E. McLoughlin, Assistant Agriculturist.

TOBACCO.

No. 605. Flue-Curing Tobacco Barns, Bulking and Grading Sheds, by P. H. Haviland, B.Sc. (Eng.), Acting Government Irrigation Engineer.

No. 607. Tobacco Seed Beds, by D. D. Brown.

No. 615. The Culture of Virginia Tobacco in Southern Rhodesia—Field Management, by D. D. Brown.

No. 617. Dark Fire-Cured Tobacco, by E. M. Matthews, B.Sc., Tobacco Adviser. Fire-Curing Tobacco Barn, by the Tobacco Advisers.

No. 629. Notes on Flue Curing of Tobacco, by C. A. Kelsey Harvey.

No. 641. The Handling, Grading and Baling of Cured Virginia Tobacco, by D. D. Brown.

No. 644. Tobacco Baling Boxes, by B. G. Gundry, Irrigation Branch.

No. 653. The Care of Tobacco Seed Beds, by J. C. F. Hopkins, B.Sc. (Lond.), A.I.C.T.A. (Trinidad).

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No. 665. Tobacco Pests of Rhodesia, by Rupert W. Jack, F.E.S., Chief Entomologist.

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No. 679. Tobacco Culture in Southern Rhodesia : The Harvesting and Curing of Virginia Tobacco, by D. D. Brown.

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No. 715. Turkish Tobacco Culture in Southern Rhodesia, by D. D. Brown, Chief Tobacco Expert.

No. 718. Preliminary Experiments on the Control of White Mould of Tobacco, by J. C. F. Hopkins, B.Sc. (Lond.), A.I.C.T.A., Chief Botanist and Mycologist.

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No. 774. Dark Fire-cured Tobacco: Harvesting and Curing, by D. D. Brown, Chief Tobacco Expert.

STATISTICS.

No. 196. Collection of Agricultural Statistics in Southern Rhodesia, by Eric A. Nobbs, Ph.D., B.Sc.

No. 209. The Agricultural Returns for 1914, by B. Haslewood, F.S.S.

No. 224. Statistical Returns of Crops in Southern Rhodesia for the Season 1914-15, by E. A. Nobbs, Ph.D., B.Sc., and B. Haslewood.

No. 230. Farm and Live Stock Statistics, 1915, by Eric A. Nobbs, Ph.D., B.Sc., and B. Haslewood, F.S.S.

No. 247. Statistical Returns of Crops Grown by Europeans in Southern Rhodesia for the Season 1915-16, by Eric A. Nobbs, Ph.D., B.Sc., and Fred Eyles, F.L.S.

No. 259. Statistics of Live Stock and Animal Produce, 1916, by Eric A. Nobbs, Ph.D., B.Sc., and F. Eyles, F.L.S.
No. 281. Statistics of Crops, 1916-17, by F. Eyles, F.L.S.
No. 286. Statistics of Live Stock and Animal Produce for the Year 1917, by Eric A. Nobbs, Ph.D., B.Sc., and F. Eyles, F.L.S.
No. 303. Statistics of Crops, 1917-18, by E. A. Nobbs, Ph.D., B.Sc., and F. Eyles, F.L.S.
No. 322. Statistics of Live Stock and Animal Produce, 1918, by F. Eyles, F.L.S.
No. 361. Statistics of Live Stock and Animal Produce for the Year 1919, by F. Eyles, F.L.S.
No. 380. Statistics of Crops Grown by Europeans in Southern Rhodesia, 1919-20, by H. C. K. Fynn.
No. 393. Statistics of Live Stock and Animal Produce for 1920, by H. C. K. Fynn.
No. 409. Statistics of Crops Grown by Europeans in Southern Rhodesia for the Season 1920-21, by H. C. K. Fynn.
No. 426. Statistics of Live Stock and Animal Products for the Year 1921, by H. C. K. Fynn.
No. 443. Statistics of Crops Grown by Europeans in Southern Rhodesia for the Season 1921-22, by F. Eyles, F.L.S., and H. C. K. Fynn.
No. 459. Statistics of Live Stock and Animal Products for the Year 1922, by A. Borradaile Bell.
No. 484. Statistics of Crops Grown by Europeans in Southern Rhodesia for the Season 1922-23, by A. Borradaile Bell.
No. 502. Winter Crops, 1923, by A. Borradaile Bell.
No. 527. Statistics of Crops Grown by Europeans in Southern Rhodesia for the Season 1923-24, by A. Borradaile Bell.
No. 543. Statistics of Live Stock and Animal Products for the Year 1924, by A. Borradaile Bell.
No. 580. Statistics of Summer Crops Grown by Europeans in Southern Rhodesia for the Season 1924-25, by A. Borradaile Bell, Statistician.
No. 595. Statistics of Live Stock and Animal Products for the Year 1925, by A. Borradaile Bell, Statistician.
No. 626. Statistics of Summer Crops grown by Europeans in Southern Rhodesia for the Season 1925-26, by A. Borradaile Bell, Statistician.
No. 646. Statistics of Live Stock and Animal Products for the Year 1926, by A. Borradaile Bell, Statistician.
No. 682. Agricultural Returns for 1926-7 : Preliminary Returns, by Thomas G. Gibson, Government Statistician.

LIVE STOCK.

No. 227. An Experiment in Beef Production, by R. C. Simmons.
No. 245. Beef Feeding Experiment No. 2, by R. C. Simmons.
No. 250. Beef Feeding Experiment No. 3, by R. C. Simmons.
No. 336. Butchering and Flaying.
No. 338. From Breeder to Butcher; Beef Feeding Experiment No. 5, by E. A. Nobbs, Ph.D., B.Sc.
No. 381. From Breeder to Butcher; Cattle Feeding Experiment No. 8, by Eric A. Nobbs, Ph.D., B.Sc.
No. 421. From Breeder to Butcher; Cattle Feeding Experiment No. 9, Government Experiment Farm, Gwebi, by E. A. Nobbs, Ph.D., B.Sc., F.H.A.S.
No. 446. From Breeder to Butcher; Cattle Feeding Experiment No. 11, Government Experiment Farm, Gwebi, by Eric A. Nobbs, Ph.D., B.Sc., F.H.A.S.
No. 468. From Breeder to Butcher; Cattle Feeding Experiment No. 13, by Eric A. Nobbs, Ph.D., B.Sc.

No. 483. From Breeder to Butcher; Cattle Feeding Experiments Nos. 14 and 15, Government Experiment Farm, Gwebi, by Eric A. Nobbs, Ph.D., B.Sc.
No. 584. Merino Sheep in Southern Rhodesia, by H. W. Hilliard.
No. 624. The Construction of Dipping Tanks for Cattle (Revised).
No. 698. The Rearing of Bacon Pigs for Bacon Factory Purposes, by T. Hamilton, M.A., N.D.A., N.D.D.
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Annual general meeting of Bindura Farmers' Association, 11th April, 1930.

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Editorial.

Contributions and correspondence regarding subjects affecting the farming industry of Southern Rhodesia are invited. All communications regarding these matters and advertisements should be addressed to:—The Editor, Department of Agriculture, Salisbury.

The Bindura Farmers' Association.—This association is in its twenty-first year, having been formed in the very early days of settlement in the district, which was then known as Kimberley Reefs. The association has a membership of forty, and meetings are held monthly in the well-appointed hall illustrated in the last issue of this Journal. Bindura is a rich farming district and produces a large proportion of our staple crops. The ranks of its farmers include some of the most progressive agriculturists of the Colony. Before cotton and tobacco declined in popular favour, excellent crops of these commodities were grown, the importance of the former warranting the establishment of a ginnery, which after a spell of inactivity is operating again this season. With the promising results of present plantings of U. 4 cotton it is expected that an increased area will be devoted to the crop next season, although we trust the experience

of 1924-25 will not be forgotten and that farmers will restrict their acreages to reasonable proportions. The village of Bindura now possesses an hotel and store, a church, bank, post office, court house and is progressing on sure and steady lines. A certain amount of mining is in progress in the district, providing markets for agricultural produce. The farmers of Bindura have great faith in the possibilities of their district—a faith which is based on the experience and tangible results of the past twenty years.

A Well Deserved Tribute.—The Shamva North Farmers' Association has elected Mr. W. A. Ludgater, of Nyamambara Farm, Poorti Valley, an honorary life member of the association in recognition of the excellent example he has shown in his general farming methods and particularly in the protection of land from the effects of soil erosion caused by storm water. Mr. Ludgater does not solicit publicity, but we know that the honour bestowed on him by his fellow farmers is well deserved, and we feel sure it will be a source of great pleasure to him. With the entry of the products of this Colony into the world's markets we are faced with the keenest competition from old established countries, and it is essential that our methods of farming be efficient and up-to-date. Nothing short of this will suffice, and anything that will help to a more general recognition of the fact will serve a good purpose. The evil effects of soil erosion have been stressed continuously in this Journal, and it is pleasing to note that the farmers of this Colony are now more fully alive to the menace. Mr. Ludgater early realised the extent to which his farm was being denuded of its best soil by the wash of storm water, and in consultation with the Irrigation Branch of this Department, took active measures to combat the evil. His example is well worthy of emulation by other farmers in danger zones.

Beef Cattle in the United States.—According to the *Agricultural Outlook* for 1930, issued by the United States Department of Agriculture, it is expected that the high phase of the beef-cattle price cycle, which has prevailed since

the latter part of 1927, will continue during 1930. It is thought, however, that average prices for all grades for the entire year may be somewhat lower than those of 1929. It is stated there is a general tendency to increase cattle numbers in the United States, and beef-cattle raisers are advised to expect a downward trend in prices over the next decade.

The number of all cattle on farms apparently reached the low point of production cycle in 1928, and since then the tendency of cattle numbers in the United States has been slightly upward. The estimated number of cattle on farms, 1st January, 1930, was 57,967,000. This was 1,500,000 head or 2.7 per cent. more than on 1st January, 1929, and 2,291,000 more than in 1928.

It is considered that there is no reason to anticipate any significant change in imports during 1930, although imports of slaughter cattle and calves from Canada and of stockers and feeders from Mexico increased slightly in 1929. Cattle movements into the United States during 1929 totalled 509,000, an increase of 13,000 head over 1928 and of 55,000 head over 1927. Conditions indicate that importations of beef into the United States during 1930 will at least equal those of 1929. About 143,000,000 pounds of fresh, cured and canned beef were inspected for entry into the United States during 1929, compared with about 129,000,000 pounds in 1928 and 80,000,000 pounds in 1927. Supplies of fresh and refrigerated beef entering the country during 1929 showed a decrease of about 25 per cent. compared with 1928. This was brought about largely by decreased shipments from New Zealand, but supplies from Canada were also materially reduced.

The position is summed up as follows:—"Farmers who contemplate entering a long-time cattle-raising programme or those who contemplate an expansion of their cattle-raising business face a general increase in cattle numbers and a consequent lowering of prices. Although the expected effects of expanding numbers of cattle may be modified somewhat by a normal expansion in domestic demand caused by growth of population, any marked increase in cattle supplies is almost certain to be accompanied by a lowering of the cattle-price level."

The Marketing of Maize.—An interesting article which reviews the world production of maize, and shows how the anticipated surplus may influence local and oversea markets, appears in the May issue of *Farming in South Africa*, which is the official journal of the Department of Agriculture in the Union of South Africa. The author states that in the approaching selling season South Africa anticipates a surplus of 12½ million bags, Argentine 73 millions; and with the Danube countries still having about 50 million bags of last year's crop in hand for export, the total quantity for export reaches 136,000,000 bags, or 50,000,000 in excess of the normal demand of importing countries. He points out that the existing marketing machinery in South Africa cannot cope effectively with the present surplus conditions, and stresses the necessity for devising methods for obtaining the highest price possible for maize. The old methods, he considers, are not strong enough satisfactorily to comply with the needs of a sound marketing system. The solution proposed is for producers to entrust the whole of their maize to a central, well-regulated and businesslike body. It is pointed out that the producer receives only 30 per cent. of the price which the consumer ultimately pays, and the argument is used that if producers through joint action could exercise greater personal control on the marketing services, the profits which otherwise flow into the pockets of the middleman will be retained by them, thus yielding a higher price to all maize producers concerned.

As a first step in this direction Dr. Geldenhuys advocates the calling of a conference attended by delegates representing the maize-producing districts, the central agency of the co-operative societies, the South African Agricultural Union, the Land Bank and the Department of Agriculture, for the purpose of deciding on a well-constructed campaign of co-operation. He considers that every farmer should, for his own sake and in order to promote generally the interests of all maize producers, join and support such a co-operative movement, and so strengthen and improve the marketing system. He thinks that if maize producers would also agree to an imposition of a levy, as in the case of the fruit, wool, poultry and skin industries, one of ½d. per bag on exported maize would bring in £25,000 this year. This sum could be devoted to the interests of the industry.

Systems of control much on the same lines as that proposed are in operation with profitable results in Denmark, Ireland, Canada, the United States of America and also in South Africa. Sixty per cent. of the Canadian wheat crop is controlled and marketed by one body. It will be very interesting to see if the seed which Dr. Geldenhuys has sown will germinate and burst into vigorous life, for it seems to us that only by some such action as that proposed can the maize producers of South Africa and Rhodesia hope to dispose of their crops to the best advantage.

The position of the maize grower in this Colony, as in the south, is serious, and it behoves every farmer to take stock of the situation with a view to seeing what measures can be taken to alleviate the effect of the present low prices which may prevail for some time. In addition to orderly marketing, the necessity for which becomes more evident every day, it is possible that economies may be effected in the growing costs and a better reward thus obtained by farmers for their labours. We shall be pleased to receive the views of readers on this point and to publish any letters which may contain useful suggestions.

Green Manuring.—In the issue of this Journal for July last year we published an extract from the annual report of the Chief Agriculturist, in which he stated that the only immediate and practical method of saving the soils of this Colony from the ruinous impoverishment taking place lies in a wide adoption of the practice of green manuring, combined with the application of artificial fertilisers. In that report attention was drawn to the fact that in the year 1928 the total acreage of green manure crops was less than 1 per cent. of the total area under crops. It is pleasing to note from the Chief Agriculturist's report for 1929 that the position has improved materially. He writes:—

"At long last the agricultural community appears to have thoroughly awakened to the value and importance of green manuring as a means—in conjunction with the use of artificial fertilisers—of maintaining soil fertility. At a recent meeting of the Executive Committee of the Maize Association the statement was made, and not refuted, that

'there was no occasion for the Department of Agriculture further to demonstrate the advantages of green manuring, for farmers were already convinced of this, and their only difficulty was the financial one of throwing large areas out of maize and into green manure crops.' This difficulty, however, must be faced and faced courageously if the worn-out maize lands of the Colony are to be restored to profitable productivity. It is to be trusted that newer settlers on the land will be warned in time, and will commence green manuring before their soils are seriously impoverished. If they do so, the high average yields thus maintained will more than compensate for the acreage annually thrown out of directly profit-earning crops."

This statement is borne out by the figures issued by the Statistical Bureau, which gives an estimate of the area under green manure crops in 1929 as 14,704 acres.

The subject of green manuring was discussed at the Pan-African and Veterinary Conference, held at Pretoria last August, where it was introduced by the Chief Agriculturist, Mr. H. G. Mundy. An interesting discussion ensued, in which the delegates of the Union of South Africa explained the conclusions drawn from green manuring experiments conducted in that country. At the conclusion of the debate Mr. Mundy summarised the position in Southern Rhodesia thus: "Our experience is this: that without the aid of green manuring in order to maintain the organic matter supply in the soil, artificial fertilisers are incapable of giving the best results. We can obtain economical and profitable increases of crops by means of using artificial manures, but if we combine the same artificial fertilisers with green manures, then we increase our yields enormously; and I can further say without any hesitation that green manuring in Southern Rhodesia is undoubtedly a profitable proposition—a fact which is rapidly being realised by our farmers there. But green manuring must—to give the optimum results—always be practised in conjunction with the use of suitable artificial fertilisers applied immediately following or prior to the ploughing in of the green crop—not delayed. I want to stress that point, which is one of importance." In further remarks Mr. Mundy said that green manuring was just as effective in the dry

areas of Matabeleland, where the rainfall ranges from 20 to 25 inches, as it is in the humid areas of Mashonaland. He believed that the matter of green manuring was one of intense importance, possibly not in the Union, but certainly further north, where farmers were confronted with much the same problems as were the farmers in Southern Rhodesia.

Flue-Cured Tobacco in the United States of America.—The *Agricultural Outlook*, to which reference is made in the previous editorial, also deals comprehensively with the tobacco-growing industry of the United States, and advances the statement that the present outlook for flue-cured tobacco in that country is only fair. Demand is expected to maintain the average rate of growth of recent years, but the supply may increase more than enough to offset this growth. Domestic consumption and exports of flue-cured tobacco have increased rapidly during recent years. Cigarette consumption has maintained an increase of approximately 10 per cent. per year. Since 1925 approximately one-half of this increase has been reflected in the increased consumption of flue-cured tobacco. Domestic consumption of flue-cured tobacco for the year ended 30th June, 1929, is estimated at 302,000,000 pounds, compared with 288,000,000 for the year ended 30th June, 1928, and 265,000,000 for the previous year.

Exports of flue-cured tobacco also have increased rapidly during recent years. For the year ended 30th June, 1929, they amounted to 414,000,000 pounds, compared with 329,000,000 for the year ended 30th June, 1929, and 289,000,000 for the previous year. Exports for the five months July to November, 1929, were slightly smaller than during the corresponding months of the previous year, but exports to the most important importing countries, except China, have materially increased. Exports to China were exceptionally heavy during the first part of the 1928 marketing season, because of anticipated increases in import and excise duties, and were lighter than usual during the remainder of the year. The outlook for exports to China, however, has been made uncertain by the recent drastic slump in Chinese exchange.

The following reference is made to Empire tobacco:—"The production of tobacco similar to our flue-cured has

received a severe setback in British colonies, and the threat of important competition from that source, mentioned in former Outlook reports, has been temporarily abated."

It is considered that the total exports this season from the United States will compare favourably with those of last season; further, that the acreage planted in 1930 will show an increase. An increase of 10 per cent. for the entire flue-cured area would result in approximately 1,250,000 acres, which, with yields equal to the average of the last five years, would produce approximately 840,000,000 pounds. This, added to a probable carry-over of 600,000,000 pounds, would result in a total supply of 1,440,000,000 pounds, or nearly 100,000,000 pounds greater than the supply of the present season.

The opinion is expressed that a total supply in excess of 1,400,000,000 pounds would probably result in prices less favourable than those of the 1928 and 1929 seasons, unless a crop of exceptional quality is produced. Therefore it is concluded that prices above 20 cents a pound are not likely to be obtained for the 1930 crop unless production is below that of 1929.

In conclusion, we wish to pay a tribute to the value of these Outlook reports. We have only summarised two portions which appear to be of interest and value to us in Southern Rhodesia, but the report contains a great deal of information of a similar nature which must be of the greatest value to agriculturists and stock owners in the United States. The following remarks from the introduction to the report are well worth quoting:—"Wise production planning must precede effective marketing. The surest way to control an oppressive surplus is to prevent it. No marketing machinery can ensure good prices and satisfactory income if the farmer plants and breeds unwisely. The day is past when farmers can safely plan on the basis of current or last year's prices or on guesses about the future. Planting and breeding operations should rest on the best possible size-up of the market outlook at home and abroad for a year or more to come."

Economic Research in Agriculture.—An interesting article on this subject appeared in the April issue of the

Journal of the Ministry of Agriculture, the author being Mr. R. J. Thompson, C.B., O.B.E., formerly Assistant Secretary, Economics Division. The writer points out that research in agriculture has been for many years mainly directed to problems affecting the physical life of crops and live stock, and it is only comparatively recently that there has been any general recognition of the fact that the business side of agriculture is no less deserving of investigation. Even now current ideas as to what is meant by economic research in agriculture are usually somewhat vague, and the writer proceeds to describe briefly some of the directions in which research is being carried on in Great Britain and other countries.

The pioneer country in economic research in agriculture is the United States, and to the example set by it much of the recent advance elsewhere is to be attributed. The work is conducted not only by the U.S. Bureau of Farm Economics, but also by the State Agricultural Colleges and Universities and by a number of Research Institutes supported by private funds. The total annual expenditure is estimated at £400,000, and this is being applied to the carrying out of over 450 separate investigations, covering such diverse subjects as costs of production and other aspects of farm management, co-operation, marketing, prices, land settlement, land values, taxation, credit, rural life, etc. This is exclusive of administrative expenditure on the collection of statistics, the promotion of marketing, etc., on which the outlay is much greater.

Progress has also been made in Great Britain, though on a much more limited scale, and since 1913 there have been eleven colleges in England and Wales and three in Scotland engaged in various forms of economic research, mainly the collection of data relating to farm costs and advising farmers in regard to farm management. Marketing is a more recent innovation, investigations having been actively undertaken by the Ministry of Agriculture during the last five years. A good deal of work of the same sort is also being done in the Dominions and on the Continent.

A great stimulus has been given to the subject by the World Economic Conference, which met at Geneva in 1927 and pressed the importance of the systematic study of the

problems of agriculture as an essential part of the economic problems of commerce and industry.

In his summary of the position the writer states, *apropos* of marketing: "It must be borne in mind, however, that in proportion as improved marketing methods are successful from an agricultural point of view, they result in a better return to the farmer. This has the result of stimulating production, which, in the absence of a constantly expanding market, is bound ultimately to cause an over-supply, and thus to depress prices and nullify the previous success. It is this economic difficulty which cuts at the root of so many otherwise promising schemes. It is one danger in attempts at price stabilisation. If the latter is to have any scientific economic basis, it involves also the stabilisation of production in relation to demand.

"Marketing organisation, then, cannot be considered by itself. Its corollary is the investigation of problems of supply, demand and price, and the question to be solved is whether a better understanding of the reactions of one on the other can point the way to a better adjustment. Over-supply due to exceptionally bountiful yields cannot be foreseen, but it is possible that over- or under-cultivation or breeding might be influenced and partly controlled by greater knowledge."

It is to aims such as these that economic research can contribute so much. The agricultural world is only in the initial stages of tracing the relationship between production and prices, and results cannot be expected at once; but the more economic research is developed, the more we shall be able to judge of the possibility of reaching some co-ordination between purchase and sale, of securing that better adjustment of supply to demand which is necessary to prevent gluts and shortages and to prevent the waste of capital and labour in agriculture.

Field Control of Frenching in Tobacco.

By J. C. F. Hopkins, B.Sc. (Lond.), A.I.C.T.A.,
Plant Pathologist.

True frenching of tobacco is not of common occurrence in Southern Rhodesia, and when it appears is usually confined to a few plants in a field which are generally situated near the edge. At one time, the disease was considered to be infectious owing to its similarity to mosaic, but, as has been pointed out by Valleau and Johnson (1), a deficiency of available nitrogen in the soil is the primary cause of the malady. As far as can be ascertained, this explanation of frenching has not been confirmed in Africa, so that advantage was taken of the appearance of the disease in severe form over an area of some 40 acres to carry out the experiments in curative measures described below:—

DESCRIPTION.

Frenching is characterised by the yellowing (chlorosis) of the leaf tissues, particularly between the veins, and the production of numerous extremely narrow, often fleshy, leaves from suckers which arise in the axils of the normal leaves both above ground and on that part of the stem which has been covered by soil in transplanting. In extreme cases the growth of the terminal bud is completely inhibited and a mass of suckers is produced at the base of the plant, which, on removal from the soil, has the appearance of being heavily infested by a flowering parasite. Sometimes plants may grow normally for some weeks and then develop frenching, in which case the lower leaves are usually unaffected, at any rate in shape, but the younger leaves are chlorotic and narrow, being difficult to distinguish from the typical

frenched leaves of the suckers which appear in abundance on the aerial part of the stem. (Fig. 1.)

EXPERIMENTS.

(a) **In the Field.**—The affected field, mentioned above, was inspected about one month after the plants had been transferred from the seed beds. All plants had an unhealthy, chlorotic appearance, and very little growth had taken place. A high percentage of plants, more than half, were more or less severely affected by frenching, and a number of apparently healthy ones were obviously developing the disease in the upper leaves. Mosaic was also fairly prevalent, probably about 10 per cent. of plants showing the characteristic mottling.

The soil had a "raw" appearance, being virgin land which had been hastily ploughed to a depth of three or four inches almost immediately prior to planting out and fertilised, in the holes, with two hundred pounds per acre of complete fertiliser containing blood meal. Random soil samples (15 of each) were taken from (i.) the furrows, (ii.) around diseased plants, and (iii.) around healthy plants, the analytical reports of which were as follows:—

Sample.	Hyroscopic moisture.	Further loss on ignition.	Nitrogen.
	Per cent.	Per cent.	Per cent.
(i.)	0.71	4.32	0.06
(ii.)	0.64	3.84	0.06
(iii.)	0.52	2.64	0.04

The lime content was almost negligible, whilst phosphates were very low in all samples. Magnesium content was normal.

The soil was of the type upon which good tobacco is frequently grown in Southern Rhodesia, being a reddish brown sandy loam containing a fair amount of coarse sand. There appeared to be no adequate reason, from the above analysis, why a high percentage of plants should develop frenching, but the usual tests for nitrates in the soil solution gave negative results, and suggested the following experiments:—

Fourteen rows, each containing a large number of frenched plants, were selected, and six duplicate rows (twelve in all) were given dressings of nitrate of soda at rates rang-

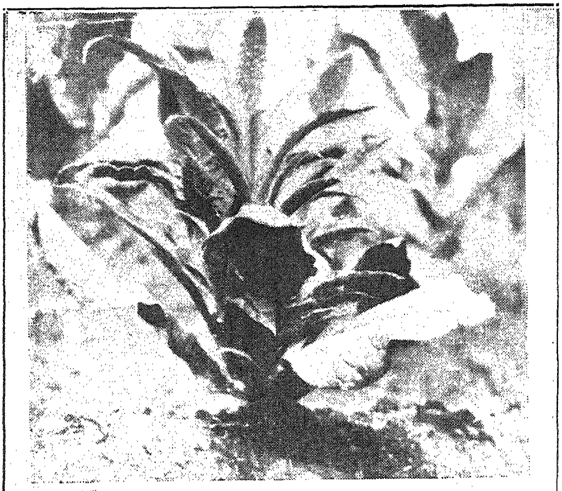


FIG. 1.

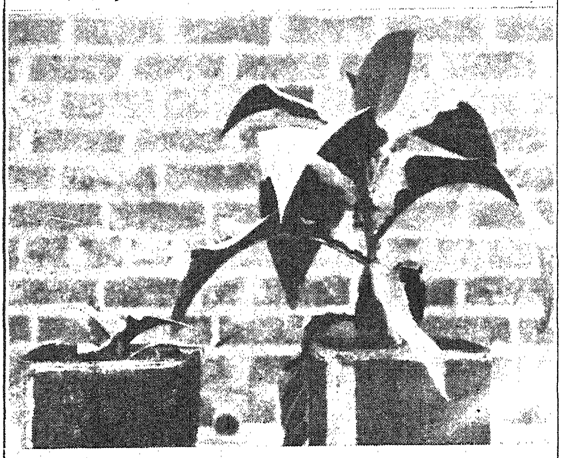


FIG. 2

Fig. 1.—Frenching in tobacco. Younger leaves chlorotic and narrow.

Fig 2.—Showing two frenched tobacco plants. The one on left received no fertiliser: the other fertilised.

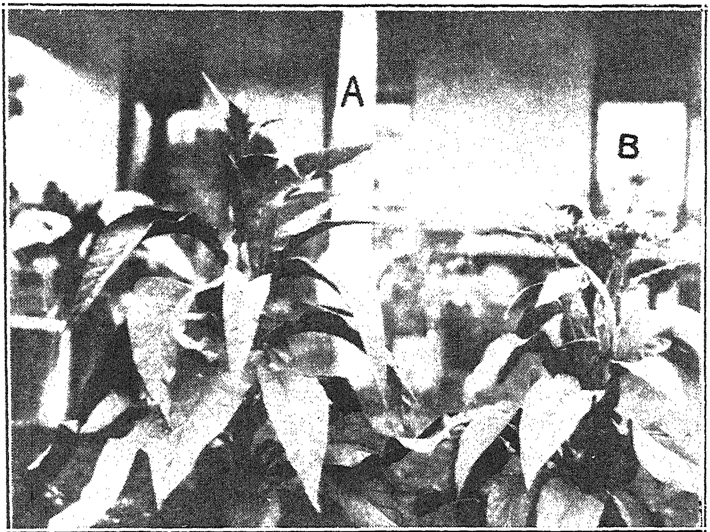


Fig. 3.—Two fertilised plot plants which received dressings of sulphate of ammonia at the rate of: A, 100 lbs. per acre; B, 50 lbs. per acre.

ing from 25 lbs. per acre to 150 lbs. per acre. Two rows were kept as controls. The rows were then separated into two series, in one of which the plants were cut down to soil level and one sucker alone allowed to grow, whilst the plants of the second series had no suckers removed.

Very soon after the application of nitrate of soda an improvement was noticed in the growth of the treated plants; those which were chlorotic and stunted, but had not produced a number of suckers, commenced to develop normally and continued to do so. Plants which were cut back to a single sucker grew out well, but a high percentage developed mosaic, infection presumably having been carried to "healthy" plants during the cutting operation. Very badly frenched plants took longer to recover than those less severely affected, and, where sucker growth was not checked, the leaves were thin and narrow. Weather conditions were unfavourable to plant growth for some weeks owing to the incidence of a severe drought, so that plants which were cut back were not ready for reaping at the same time as the rest of the field; they were, however, reaped and cured later.

It was found that dressings of nitrate of soda (applied in the usual manner round each plant) of less than 45 lbs. per acre were not efficacious in curing frenching, but that no special benefit was obtained by applications in excess of that amount; on the contrary, heavy applications of the fertiliser encouraged vegetative growth to a degree which prevented the normal ripening of the crop and made flue curing a difficult operation. Forty-five lbs. per acre of nitrate of soda applied to the whole of the affected field brought about a great improvement in the condition of the crop, so that it is reasonable to assume that a deficiency of "nitrate" nitrogen was the limiting factor in the growth of the plants and was responsible for the appearance of frenching. This supposition was strengthened by the fact that the disease was most prevalent and most severe in places where large trees had been removed and the sub-soil brought to the surface. In confirmation of these observations, the following experiments were carried out in the laboratory:—

(b) **In Plots and Pots.**—A number of badly frenched plants were collected from the field, placed in soil in a tin

and transferred to the laboratory; they were then transferred to (i.) plots of red sandy loam deficient in nitrogen, and (ii.) pots containing similar soil. After one week, a slight improvement was noticed in all plants. The narrow, chlorotic and fleshy leaves had widened out somewhat, were less chlorotic and of thinner texture, but little increase in size was noticeable. One-half of the plants were now cut down to soil level, the others remaining untouched. One week later, a number of the cut plants showed symptoms of mosaic in the young bud leaves, which were just starting to open out.

The plants in both tins and plots were now given dressings of either nitrate of soda or sulphate of ammonia at the rates of 50 lbs. and 100 lbs. per acre; a number were unfertilised and used as controls. The tins were placed in the glasshouse, where they were subjected to temperatures as high as 126 deg. F., and were watered regularly each day. Four days later, increased growth was noticed in fertilised plants in the glasshouse and in the plot, whilst within two weeks the cut plants in the glasshouse had grown to a height of about two and a half feet, their development being apparently normal. Control plants made no growth. (Fig. 2.) Unsuckered fertilised plants in both glasshouse and plot produced three or four branches which were indistinguishable from the main stem, all the leaves being narrow and of thin texture. The cut plants in the plot, as would be expected, did not make as rapid growth as those in the glasshouse, but the fertilised plants had grown to a height of about eighteen inches, whilst the controls remained almost unaltered.

After seven weeks, the plants which had grown from a single sucker were quite normal in appearance, and on being "topped" produced good quality leaf of average size. Those which had been allowed to produce several stems ripened earlier than the cut plants and produced narrow leaves lacking in body and thin in texture; they presented no abnormal characteristics whatever. Controls retained the symptoms of frenching for some time, but eventually grew into very small and weak plants. The plants which received the larger dressings of fertiliser continued to make vegetative growth long after the others had come into flower and were ripening,

so that in every way they behaved as normal tobacco plants might be expected to under such conditions.

Figure 3 shows two fertilised plot plants which had received dressings of sulphate of ammonia at the rate of—

A	100 lbs. per acre
B	50 lbs. per acre

and on which suckers had been allowed to develop freely.

Two plants, one receiving nitrate of soda at the lower rate, were grown in the soil taken from the original field. Both, after being cut down to one sucker, behaved in the same way as the other experimental plants.

CONCLUSIONS.

The above experiments indicate clearly that frenching in tobacco results from a deficiency of available nitrogen in the soil and can be cured by applications of fertiliser designed to make good this deficiency whether the fertiliser be physiologically acid or alkaline in re-action. The presence or absence of other plant foods is not in any way connected with this disease, which apparently results from the raising of the carbohydrate-nitrogen ratio in the plant. It is interesting to note that this physiological change has the effect of inhibiting the development of the terminal bud whilst at the same time stimulating the growth of the lateral branches which do not normally develop until the plant produces flowers, when, presumably, the same effect is brought about by the elaboration of nitrogenous substances.

In devising control measures, it is necessary to study the causes of frenching, and the particular instance recorded here will serve admirably as an example.

Firstly, the soil had not previously been cultivated and was deficient in humus. Secondly, it had been cultivated hastily a short while before transplanting, so that what vegetable matter had been ploughed in remained undecomposed and nitrifying organisms, due to lack of aeration, had had no time to become active and multiply. Fertiliser, in which nitrogen was principally in organic form, was added about the time of planting, but on the following days heavy rain was experienced, which undoubtedly washed from the ridges as much of the food material as was soluble and avail-

able to the plant, together with much of the silt which is found in "contact" soils, thus accounting for the better analysis of the soil samples taken from the furrows. This heavy precipitation was followed by a prolonged period of dull, cool weather with frequent showers, which not only inhibited the growth of tobacco plants, but also stopped the nitrification of the organic material in the fertiliser and increased the leaching effect. There is little wonder, therefore, that no nitrate (i.e., available nitrogen) was detected in the soil analysis.

The prevention of frenching in tobacco thus depends on the thorough preparation of soils, whilst the disease may be cured by applications of nitrate of soda or sulphate of ammonia, whichever is considered to be suitable.

It appears to be advisable in severe cases to cut down the plants and allow one sucker only to grow, but the utmost care must be taken to prevent infection by mosaic. In this connection, it would be as well for the cutting tool—hoe or cutlass—to be rinsed in disinfectant solution at the end of each row.

My thanks are due to the Division of Chemistry for analysis of soil and for supplying the fertiliser for the field experiment.

SUMMARY.

(1) Confirmatory evidence is put forward that frenching in tobacco is a nitrogen deficiency disease.

(2) Field control of the disease has been successfully accomplished by the applications of readily available inorganic nitrogenous fertilisers.

(3) The causes of the soil conditions which bring about frenching are discussed.

(4) The necessity for taking precautions against infection by mosaic whilst carrying out control measures is emphasised.

REFERENCE.

(1) Valleau, W. D., and Johnson, E. M.—Tobacco Frenching—a nitrogen deficiency disease—*Kentucky Agric. Expt. Station Res. Bull.* 281, pp. 179-253. 1927.

The System of Cadastral Surveying in Southern Rhodesia.

By L. M. McBean, Assistant Surveyor General.

Administration.—Cadastral surveys in this Colony are undertaken mainly by qualified Government land surveyors in private practice. The term "Government land surveyor" does not imply that the surveyor is a Government official, but is the name applied to those who have obtained qualifications in land surveying which are approved by the Government, and who have been granted a licence to survey in the Colony. The Government will not accept plans for registration in the Deeds Office unless signed by a licensed surveyor with such qualifications.

The Lands Department employs fully qualified surveyors from time to time—sufficient to their requirements in coping with Departmental work in connection with the current policy of land settlement. These men are Civil Servants, and their work might be classified as "revenue surveys," although the costs of their surveys are seldom recovered in a lump sum, but rather by including an estimate of the costs of survey in the agreed purchase price of the property, payments of which are made in instalments over extended periods.

New surveys of unalienated Crown land may be undertaken only on instructions issued by the Surveyor General. Instructions for sub-divisional surveys of privately held properties are given by the owner direct to the surveyor, but in all cases where the sub-division is to be registered in the Deeds Office the diagrams must be passed by the examiner of diagrams and the deduction laid down on the Deeds Office copy of the original diagram by the Registry Surveyor.

The examiner of diagrams passes a diagram when he is satisfied that the data given thereon are consistent, which fact he certifies on the diagram itself. The sides and angles are also compared with any adjoining surveys, and any considerable discrepancies with previous surveys are investigated and reports filed for future reference. There is no system of examination of field work, but the Surveyor General has the power to call for the field books, calculations and working plans of any survey. Also, if he has reason to doubt the accuracy of the survey, he may appoint an independent surveyor to check the field work.

Linear and Surface Measure.—The Cape measure was adopted at the time of the occupation of Southern Rhodesia and is still in use. Distances are measured in Cape roods and Cape feet, and areas in morgen, Cape square roods and Cape square feet. Heights above sea level, when determined, are given in English feet.

On diagrams of plots of ground which are in extent less than 10 morgen all distances are given in Cape feet, otherwise distances are given in Cape roods.

Distances are given to two decimal places of the unit in which they are expressed. Angles are given to the nearest 10 seconds.

1 Cape foot = 1.033 English feet.
1 Cape rood = 12.396 English feet.
1 Cape rood = 4.132 English yards.
425.944 Cape roods = 1 English mile.
1 morgen = 2.116540 acres.
1 acre = 283.4816 Cape square roods.

Methods of Survey.—Methods of triangulation and traverse are used, at the discretion of the surveyor, according to local conditions. Preference is given to triangulation whenever possible.

There is in existence a chain of primary triangulation through the Colony, but as yet no trigonometrical work of a secondary or tertiary nature has been done, although this matter is now in hand. In the absence of such a network of control points, each survey must rely on a base measured by the surveyor, and in the more extensive surveys a check

base is also measured. The surveyor also determines astronomically the azimuth of one of his lines, which determines the system of co-ordinates adopted.

In certain cases, as, for instance, when it is impossible to find a suitable site for measuring a base line, the surveyor may adopt a side of some previous triangulation as a base and work down to his own measured check base. Such a procedure must be reported to the Surveyor General, and the check base is required to be measured with the same degree of accuracy as a new base.

Theodolites are used for angular measurements. The type in common use has a 5-inch horizontal circle read by verniers or micrometers. Other types of theodolites giving no less a degree of accuracy are also used.

Steel tapes, generally 300 feet long and ⅛-inch wide, are used for measuring distances. Longer and narrower tapes are sometimes used in traversing flat, bushy country, and shorter and broader tapes for township work. A standard base, 300 feet long, in sections of 100 feet, has been laid down in a secluded place at Salisbury. Surveyors may test their tapes on this base from time to time or may send them to be tested by the Surveyor General.

River boundaries are determined by offsets from tacheometer traverses, theodolite and chain traverses or compass and pacing traverses. The method used depends on the scale to which the river is to be plotted, and must in all cases be controlled by a traverse starting from and closing on points fixed in the main survey.

Railway curves must be accurately determined, the coordinates of the tangent points and the length of the radii being given on the plan.

Amended Titles.—The Surveyor General may recommend the issue of an amended title in order to rectify an erroneous survey. In such cases a full report on the new survey, with particular reference to the methods used and full information in regard to the condition of the beacons found, must be submitted by the surveyor. The consents of the surrounding owners must also be obtained.

Many properties are still held under provisional title, their diagrams having been framed from compass surveys many years ago. Whenever it is required to transfer a portion of such a title, a re-survey of the property is insisted on and a final title is issued in lieu of the old title. From this new title the transfer of the sub-division is deducted. In this way these old provisional titles are gradually being eliminated.

Plans and Diagrams.—For new surveys of land to be granted by title deed, a general plan and three diagrams are required. The general plan is filed in the office of the Surveyor General, one diagram is attached to the title deed given to the grantee, one is attached to the deed filed in the Deeds Office and one for the titles office of the Lands Department. In cases of sub-divisions two copies of the diagram are required, one for the owner and one for the Deeds Office. (For surveys in Matabeleland one extra diagram of both original and sub-divisional surveys is necessary for filing in the Bulawayo Deeds Office.)

Plans of farms of two to four thousand acres are usually drawn to a scale of 400 Cape roods = 1 English inch, and township lots 200 Cape feet = 1 English inch. In no case must the area of the figure on a diagram be less than 1 square inch.

In the case of new surveys there must be shown on the general plan all stations used in the survey, with their co-ordinates. This information is thus available from the Surveyor General's office for reference at the time of future sub-divisional or adjoining surveys.

The directions of both true and magnetic north at the date of survey must be given on general plans of new surveys. These data, coupled with the results of the Magnetic Survey of South Africa, by J. C. Beattie, D.Sc., in 1904, will in time provide sufficient material for the production of a map of isogonic lines. Such a map would be invaluable to farmers and others making use of the prismatic compass.

Connections and Mapping.—Any new isolated survey must be connected to two established beacons of some previously surveyed area. When this is not expedient, owing to the excessive length of such a connection, it is permissible

to erect two permanent reference beacons, giving their co-ordinates on the local system. These points will ultimately be connected to other surveys in the neighbourhood or embodied in the tertiary triangulation of the country in the future.

There are in existence a number of large triangulations covering extensive areas of the Colony. These triangulations were performed by various firms of surveyors in private practice in order to co-ordinate their work and facilitate their own operations in the future. These large triangulations are apt to appear of more value than their true worth, chiefly owing to the fact that the centre marks of the beacons and stations are very often obliterated. Another matter which detracts from their value is the fact that they are based on an azimuth determined near the origin of co-ordinates, which causes distortion when dealing with areas far removed from the origin in an easterly or westerly direction. For plotting purposes, however, they are of more value than small isolated surveys, and are very useful when compiling data for small scale maps of the country. It is hoped that in the future, when the secondary and tertiary triangulations are in hand, several of the more important of these points will be incorporated therein, and gradually the minor points will be embodied in the main system of co-ordinates, and eventually all surveyed points will be on the national system.

Filing and Reference.—Surveys of properties are filed in districts, and all sub-divisions of properties are filed, together with the parent deed. This method is in some cases becoming somewhat cumbersome, and the matter is now under review. Some system of numbering of farms with reference to their geographical position within certain limits of latitude and longitude will probably be adopted.

Topography.—When the topography of the ground surveyed is well defined it must be clearly shown on the diagrams and general plans. The shading of hills must be in colour, but not so deep as to interfere with the clear delineation of deductions which may in the future have to be marked off on the diagrams. The topography in the neighbourhood of beacons is represented with special care

and every reasonable means used for facilitating the identification of beacons.

The data thus supplied to the Surveyor General, together with the data of various reconnaissance and other surveys by officials of the Roads, Irrigation, Mines and Public Works and Geological Departments, form the basis of the topography shown on the general map of the country.

Survey Fees.—The fees payable in respect of surveys instructed by the Surveyor General are controlled by a Government tariff. Fees for sub-divisional surveys instructed privately are a matter for arrangement between the owner and the surveyor. It is, however, the usual practice for surveyors to adhere to the Government tariff in all cases.

Pretoria Agricultural Society.

We have received notification from the society that owing to unforeseen circumstances it has been decided to abandon the maize and citrus show which was to have been held on the 12th to 14th June. Reference to this show was made in the last issue of this Journal.

Bacon Curing on the Farm.

By T. Hamilton, M.A., N.D.A., N.D.D., Dairy Expert.

(The following article appeared in the issue of this Journal for October, 1924. It is reprinted in response to frequent enquiries for information on the subject.—Ed.)

Successful results in the curing of bacon on the farm depend almost entirely on five factors. These are:—

(1) The breed, weight and feed of the pig.

(2) The materials used.

(3) The coldness of the weather when the pig is killed.

(4) The maintenance of an equable cool temperature during the time the flesh is being cured.

(5) The conditions under which the bacon is stored.

The Breed, Weight and Feed of the Pig.—The cross generally advocated for bacon purposes is the cross between the Berkshire boar and the Large Black sow, whilst others prefer the Middle-White or the Tamworth cross. The breed, therefore, is a matter of choice, but the most important item to be considered is that the farmer should be able to bring his bacon pig to bacon weight—160 lbs. to 190 lbs.—in the space of from 6 to 7½ months, as heavy pigs are difficult to cure. When heavy carcases are cured on the farm there is almost always a certain amount of loss, especially in the hams and shoulders, through "bone taint," because in these cases it is extremely difficult to ensure that the animal heat is out of the body before curing is attempted.

On the other hand, if the pigs are too light there is apt to be excessive drying out, and the resultant bacon becomes hard, dry and flavourless.

The feeding of the pig is most important. It is found that where separated milk and green stuff are available the pig puts on weight most rapidly and economically, especially when these rations are augmented with grain. There appears to be no really effective substitute for separated milk in the feeding and rearing of pigs, although fish meal and meat meal seem to be a good source of protein when whey is fed. Ground nut cake is also an effective feed, but it does not give such satisfactory results either in growth or in the flavour of the finished product as milk. During the last month of the bacon pig's existence it is good practice to leave out milk and substitute a larger proportion of hard grain. At this time nothing gives better results than a ration of one pound of crushed oats or barley meal per day. This ration has the effect of hardening up the flesh and imparting a more delicate flavour to the bacon.

Materials Used in Curing.—The materials generally used in bacon curing are salt, saltpetre, sugar, spice and treacle.

The salt used should always be of good quality. Coarse cattle salt and many colonial salts, unless sold with a guaranteed analysis, contain impurities which will not only tend to make the bacon hard, but will also have the effect of giving it a bitter and unpleasant flavour. One sample of salt sold for bacon curing purposes which came under the writer's notice contained as much as 6 per cent. of magnesium sulphate or Glauber's salt. It is essential also that the salt be thoroughly soluble, otherwise it will not penetrate into the flesh. The best salt to use is imported Liverpool salt, guaranteed to be 99 per cent. pure sodium chloride.

Saltpetre, which possesses mildly antiseptic properties, is commonly used in bacon curing, especially to preserve the natural colour of the flesh, but its excessive use causes the flesh to become hard and dry and the colour to become a deep brown. This again becomes a dirty clay colour when the bacon is cooked. For this reason as little saltpetre should be used as is conducive to the desired effect being obtained. The quantity should not exceed the proportion of 3 per cent. of the amount of salt employed in the curing process.

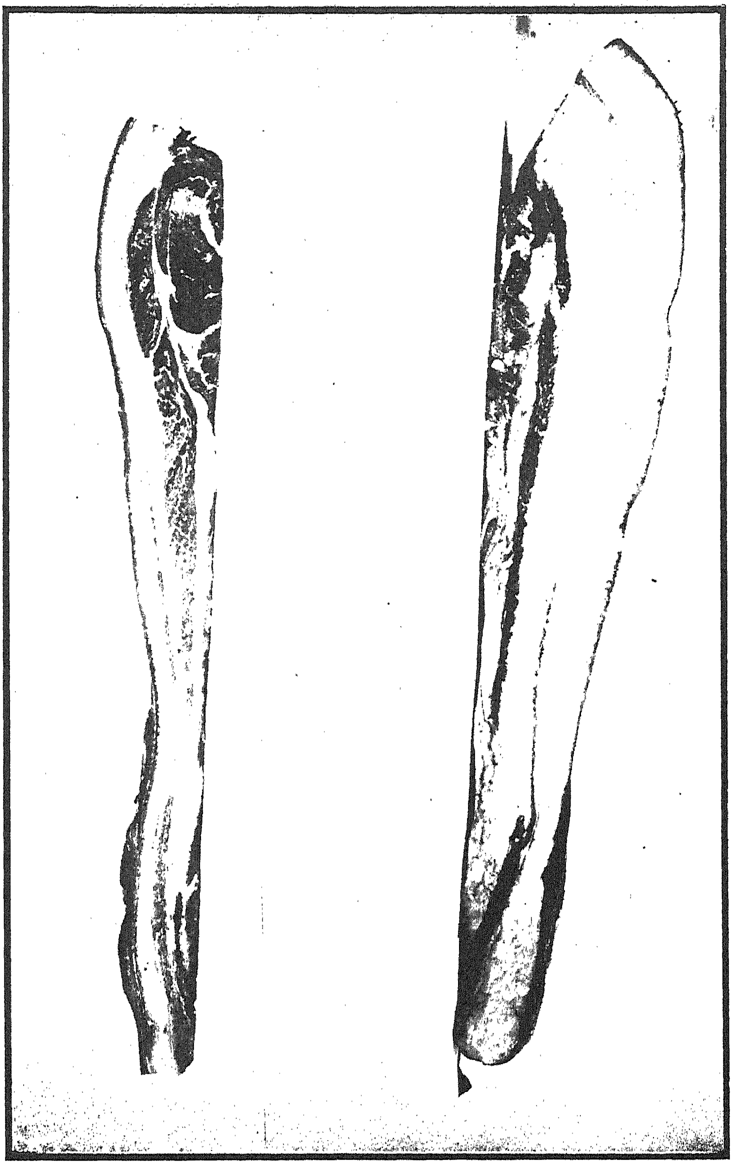


Plate I.

Two sides of bacon. On left, Large Black ; on right, Berkshire.

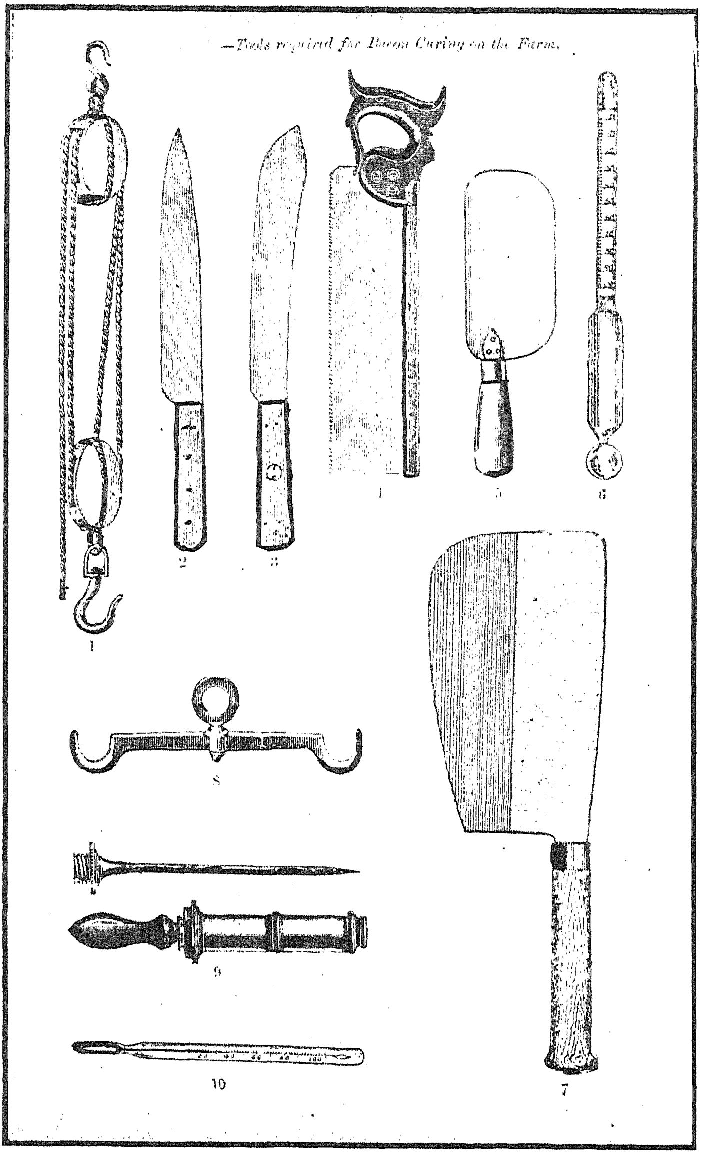


Plate II.

Appliances used in the slaughtering of pigs and curing of bacon.

Sugar is frequently used, especially if the brine method of salting is employed. It is of course a mild preservative, but its use is not advised if the weather tends to become hot. When the curing temperature is high the use of sugar may have the effect of causing undesirable fermentation and the consequent souring of the meat. The excessive use of treacle under the same conditions has a similar effect, and unless the weather is cold and the temperature of the brine solution kept below 60 degrees F., the use of either sugar or treacle is not altogether recommended. For a mild cure under suitable conditions, however, its use may be advocated, as excess of salt is not then required.

Spices are used according to taste and according to the degree of flavour required. Allspice is most commonly used, but cayenne and black pepper, bay leaves, coriander seeds and cinnamon are used as the popular taste demands. In Southern Rhodesia, however, very little spice is used, as its flavour may be repugnant to many.

Slaughtering and Preparation of Carcase.—Before being killed the pig should be deprived of food for at least 24 hours. It should be killed preferably late in the afternoon, when there is every promise of a clear frosty night. When killed and properly bled it should be "scalded," i.e., the hair should be softened by immersing the carcase in hot water at a temperature of 170 to 175 degrees. Boiling water must not on any account be used, as the hair and outer skin will be burnt fast and it will be impossible to scrape the hair off cleanly. If a thermometer cannot be obtained, a simple method to obtain the requisite temperature is to pour boiling water slowly into the vessel and allow it to stand for three to four minutes until the temperature is reduced. A good sized tub is large enough for the purpose, i.e., if a pulley block is available, so that when the fore-quarters have been scalded the pig can be hauled up and the hindquarters exposed to the heat long enough to enable the loosened hair to come off readily in the hand. The hair should then be scraped off with a blunt instrument; a piece of stout hoop iron or a large kitchen spoon is often used for this purpose. The carcase is then cleaned and washed with cold water and the backbone cut down the centre and removed almost at once. This will facilitate the cooling off

of the carcase, which should be allowed to hang in an open, airy place over night to cool off and set.

Next morning the head is removed and the two halves laid on a table and the shoulder cut off behind the shoulder blade. The blade bone should be removed and the feet cut off. The hams—that is, if cured independent of the sides—are then cut off at the third joint from the tail and the hip bone cut out. The cavities caused by the removal of bones both from the shoulder and hams should be lightly dusted with boric acid powder.

The Process of Curing.—When the carcase has been cut up and trimmed it is a good practice to dust the flesh lightly by means of a hair sieve with a mixture of two parts finely ground salt to one part of finely ground saltpetre. This should be applied extremely lightly and will serve to fix the natural colour of the flesh.

The process of curing should always be conducted in a pure, cool atmosphere and under conditions of strict cleanliness. The temperature of a heavily thatched curing room should not exceed 60 degrees if the proper season of the year is chosen for the operation.

Dry Curing.—For a carcase weighing 130 lbs. or thereabouts the following mixture is recommended:—

10 to 12 lbs. dry dairy salt.
3 to 4 ozs. saltpetre.
½ oz. mixed spice (if desired).

The meat to be cured should be placed in a wooden tub or in a brick and cement trough. Galvanised baths are sometimes used, but the salt has a corroding action on the zinc and this may give the flesh undesirable metallic flavours. The hams should be placed at the bottom and the sides on top, and the mixture spread freely over the sides (flesh side up) and hams, placing more salt on the thicker and fleshy portions than on the thin portions. The bones and bone cavities should receive special attention.

The sides should be turned every day and the hams rubbed and turned every other day. The red liquid which exudes should be ladled over the hams when the sides are turned. The sides should be cured in from 6 to 8 days and the hams from 14 to 20 days, according to the weight and

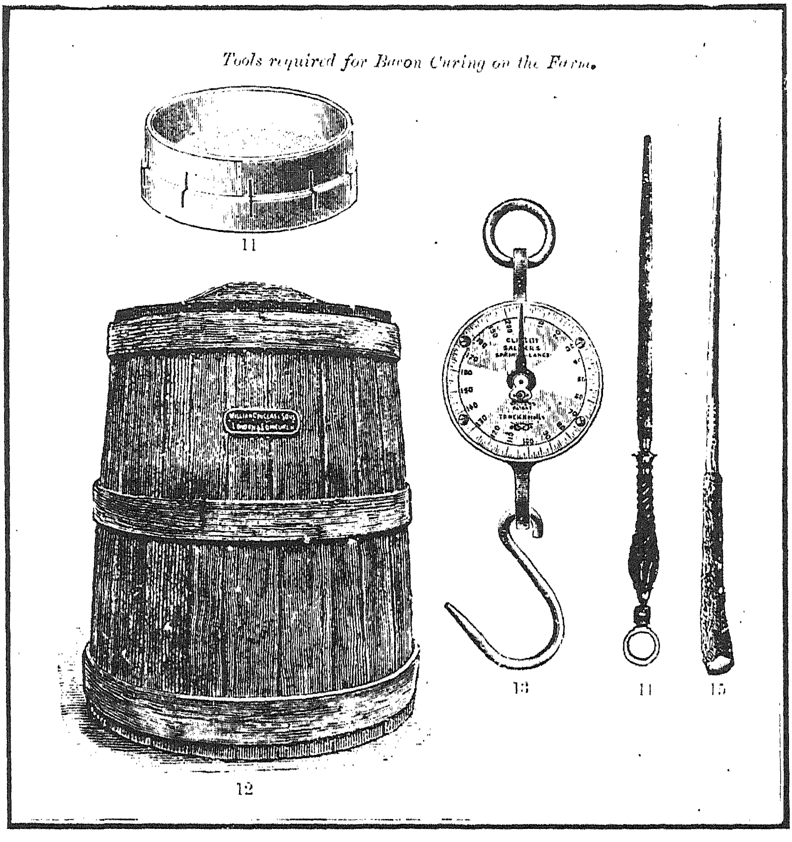


Plate III.

Appliances used in the slaughtering of pigs and curing of bacon.

thickness of the meat and the degree of "cure" desired. Another mixture recommended for a similar weight of carcase is as follows:—

10 lbs. dry dairy salt.
2 to 3 lbs. brown sugar.
3 ozs. saltpetre.

This gives good results if weather conditions are good.

Pickling.—The following pickle gives good results for a carcase weighing approximately 130 lbs.:—

8 lbs. fine dairy salt.
4 lbs. brown sugar.
3 ozs. saltpetre.
1 to 2 ozs. allspice (if desired).

Mix up this pickle and dissolve the salt and saltpetre in four to five gallons of water. Tie up the allspice (if used) in a calico bag and boil the whole for an hour. Skim off any scum or frothy matter which rises to the top. Cool down the solution to as low a temperature as possible. If the pickle is up to strength, a fresh egg or a potato should float in it. Before putting the sides into the pickle, they should be covered lightly with salt and left for a day. The pickling should be done either in a wooden tub or in a brick and cement trough. Galvanised iron baths should not be used. The meat should be turned over every two or three days. It may be necessary to place sufficient weights on the sides to keep them immersed. Pieces or planks of hardwood suitably weighted are generally used for this purpose. Before being used they should be thoroughly cleansed and soaked for a day or two in pickle. The meat should be turned every alternate day. The time that the meat is in pickle is determined by the weight and thickness of the sides and hams. It varies from 15 to 30 days, according to circumstances. Pickling should be done, like dry salting, in a building which can be maintained at a constant temperature. A dairy with insulated walls and ceiling can be maintained at a uniform cool temperature at this time of the year. In it it is advisable to build a brick and cement trough, which in winter can be used for bacon curing purposes, and in summer can be filled with water in which the cream cans may be immersed and thereby kept cool.

The Use of the Pickle Pump.—The use of this pump or syringe is advocated, especially if the weather is considered unfavourable for ensuring a sound cure by ordinary methods. A pickle strong enough to float a sound potato should be used and the point of the instrument forced into the fleshy parts of the meat and the liquid injected. The points of application are especially those from which bones have been removed, such as the seat of the shoulder blade and hip bones. When this operation is complete the dry-salting method of curing is generally applied. No hard and fast rule can be laid down as to the time elapsing before the cure is complete. Everything depends on the degree of cure desired and on the thickness of the meat. It may extend from 7 to 14 days in the case of the sides and more than double this period in the case of the hams.

Washing the Bacon.—When curing is complete the meat is washed after surplus salt (in the case of dry salting) has been removed. Any loose pieces of fat and flesh should now be trimmed off, leaving the hams and the sides neat and shapely. They should next be washed in lukewarm water (not exceeding 100 degrees) and dried before being smoked. Drying should take place in a darkened building, free from flies or other insects, through which a current of cool fresh air is blowing. Drying should usually be completed in two days if the weather is favourable.

Smoking.—Smoking is practised because of the preservative action which the smoke has upon the flesh, and also to impart a flavour which is relished. To ensure that the flesh will take the smoke it is essential that the meat be dry before the process of smoking is begun. Hardwood sawdust or chips are generally used for smoking purposes, and almost any native wood of the acacia type is suitable because of the amount of tannin which these trees contain. Mealie cobs are also often used with good effect. Mopani wood, however, should never be used because the leaves, bark and timber of this tree contain appreciable quantities of copal varnish, the flavour of which, of course, would taint the meat. Sawdust and chips from imported timber should also not be used. This timber contains turpentine, which, on being vaporised, gives the bacon and hams an objectionable "woody" flavour. The smoke house is a simply constructed building high

enough to ensure the meat being kept away from the heat of the fire. It should have a small ventilator near the roof on the opposite side of the building from the door, so that when the latter is shut a limited through draught will carry the smoke upward. There should, of course, be some means of regulating the amount of air admitted, and for safety a thatched roof should be avoided. There must, of course, be no windows, and the room must be as dark as possible. In fact light should, as far as possible, be excluded throughout the curing process. Sunlight has the effect of bleaching the colour or causing unsightly blotches to appear. The time during which the meat is exposed to the smoke varies from one to three days, according to the depth of colouring required. It is always essential to have the smoke as cool as possible and to keep the direct heat of the fire away from the meat. A good way to do this is to place a sheet of corrugated iron resting on four supporting pillars of bricks so as to raise the iron about two feet above the fire between the fire and the meat.

When the smoking process is complete, the door of the smoke room should be opened and the bacon allowed to cool off before it is handled.

Storing the Bacon.—Bacon must be stored in a cool place away from all possibility of exposure to blow flies or other insects. There is a large amount of loss every year in farm cured bacon because of the careless way in which it is allowed to hang in places to which flies have full access. Even if these flies do not lay their eggs in the meat, they in a large number of cases carry mites which do infinite damage to hams, bacon and cheese. An excellent way to prevent loss from these causes is to make loose bags of cheap calico or hessian and saturate them in a limewash to which a small quantity of liquid glue has been added. When these bags are dry the bacon and hams, which have been wrapped in grease-proof paper, should be placed therein. The bag is then sewn up and the bacon hung in a cool room until required for use.

Notes from the Irrigation Branch.

Drainage of Vleis.—It may be thought that this branch has consistently regarded the drainage of vleis as being harmful. This is not actually the case, as it is realised that some of the most fertile soil in this Colony is situated in the vleis. The common practice of draining these vleis by means of open furrows set on a steep grade without any provision of soil erosion protection works is, however, deprecated very strongly.

The ultimate results of this practice are the loss of the soil from the vleis, the substitution of dongas instead and permanent diminution in the winter flow of streams draining from these vleis. Where, however, the drainage furrows are set on a very flat grade and due care is taken to ensure the safe passage of flood water through a protected strip in the centre of the vlei, the results will be more beneficial than otherwise. By this method the drainage is kept under absolute control and natural conditions can be restored at any time by blocking the drainage furrows at intervals. This system, therefore, permits of sub-soil irrigation being practised during the winter months or during lengthy dry spells in the ordinary rainy season. As many farmers are aware, a system on these lines has been developed with great success by Mr. S. le Roux at Avondale West.

One great disadvantage of the method, however, lies in the fact that in many instances the open furrows divide the area into a number of small plots on which only hand cultivation is possible. The ideal system is one in which the surplus water is drawn off by means of closed French drains discharging into a central open channel. In the majority of instances, however, suitable stone for placing in the drains is so far removed from the vleis that the cost of drainage by this method is prohibitive. Formerly suitable drainage tiles were not available locally, but farmers may be interested to know that the Eclipse Brick Co., Salisbury, are now manufacturing a very suitable 3-inch diameter pipe

in one-foot lengths which can be purchased at a cost of £12 per thousand if quantities over 5,000 are taken. On the basis of drains 100 feet apart, the cost of the tiles would therefore work out at £5 per acre, and in addition there is the cost of excavating and back filling the drains.

The above method is the only suitable one to adopt in vleis where there is any considerable depth of "peaty" soil. The great majority of our vleis, however, particularly in the granite areas, are not of this type, but are underlain at a depth of about 2 feet by clay. In these cases the most satisfactory and economical form of drainage to adopt is that known as "mole drainage," which has received considerable attention in England during recent years. In this method the mole, which is a steel sheet about 2 inches in diameter, is drawn through the underlying clay and the water drained through the pipes thus formed into a central open drain. It is similar, therefore, to the "French drain" system, but the expense involved in excavating and back filling the drains is avoided. Considerable power, however, is required to draw the mole through the clay if the drains have to be pierced at any depth, the draw bar pull necessary varying from 2,600 lbs. at 12-inch depth to 8,000 lbs. at 24-inch depth. This is beyond the capacity of an ordinary tractor if the tractor moves with the implement, and formerly expensive steam tackle outfits or high powered tractors had to be employed. Recently, however, by anchoring the tractor and using a windlass and cable for drawing the mole, excellent results at depth have been obtained with ordinary tractors.

At Gwebi last season good results were obtained with a small mole drainer hauled by oxen, but in this case the mole drainer was operated at the bottom of furrows which had been ploughed out to a depth of 12 inches, these being later refilled. It is to be hoped that some of the tractor firms in this Colony will take up the question of supplying these windlass and cable attachments for their tractors, as there would undoubtedly be a demand for units of this type.

Duty of Water.—Practically no data are available in this Colony or in the Union of South Africa regarding the amount of water required by different crops and the correct stages of plant growth when water should be applied, although

knowledge of this nature is of prime importance for securing the best economic returns from irrigated lands. It is unfortunate that at present there is no Irrigation Experiment Station in this Colony where information of this type could be obtained. A publication entitled "Use of Irrigation Water on Farm Crops," received recently from the Canadian Department of Agriculture, is enlightening in this respect. From experiments conducted at Alberta during a six-year period it was found that the optimum yields of wheat were obtained when a total quantity of 18 to 20 inches of water (either by rainfall or irrigation) was supplied to the crop. Three heavy 6-inch waterings, applied before sowing, at shot blade and at flowering stage, were found to give better yields than a number of lighter applications at more frequent intervals. The average yield of wheat under these conditions was 16 bags to the acre.

For lucerne the best yields were obtained when a total quantity of 24 to 27 inches of water was supplied to the crop, applied in about six 4-inch waterings.

The best stages for application appeared to be one irrigation when each crop is 12 inches high and one irrigation either immediately before or after cutting each crop.

For potatoes the best yields (average 130 bags per acre) were obtained when a total quantity of 18 inches of water was supplied to the crop and applied in about six 3-inch waterings. As regards the time of application, it may be stated that a good supply of water is needed in the soil at the time of planting; little or no water is needed during the first period of growth until the plants are about 6 inches high, and thereafter water should be applied at intervals of about ten days and discontinued about a month before harvesting.

While it is not stated that the above practice would be suitable under our conditions, it is merely put forward as a line for investigation by those growing irrigated crops.

Matabeleland Circle.—The Irrigation Engineer, Matabeleland, supplies the following notes:—

There appears to be an increase in the interest displayed in irrigation matters and in the subject of conservation of water generally. Several leading farmers and ranchers have

stated that the works carried out last year without any doubt proved the justification for the expenditure incurred. There is a tendency towards more open discussion on the subject of conservation of water among the individual members of the agricultural community, but it is considered that debating the matter at meetings of farmers' associations would aid considerably in effecting a satisfactory solution to the problem of obtaining adequate water supplies in the more arid portion of the Colony. Although this office has now been in existence for a year, it is evident that a great number of farmers are still unaware of the fact that advice on water matters is available from Bulawayo.

The late rains experienced in Matabeleland may tend towards a false sense of security in the matter of sufficient stream flow, and the agricultural community would be well advised to take the necessary steps now to make certain of a sufficiency of water for stock and irrigation purposes.

The irrigation reconnaissance survey party is still engaged on the survey of the Umshandige project, near Fort Victoria, but it is hoped that this will be completed in some two months' time, when the intention is to carry out reconnaissance work in the neighbourhood of Bulawayo.

C. L. R.

Agricultural Experiment Station, Salisbury.

ANNUAL REPORT OF EXPERIMENTS, SEASON 1928-29.

By H. C. ARNOLD, Manager.

(Published with the Authority of the Chief Agriculturist.)

PART II.

LIMING TRIALS.

Liming Trials were commenced four years ago, when duplicate plots were dressed with half-ton and one ton of lime per acre respectively. Two control plots, which received no lime, were included in the experiment. Maize has been grown on these plots each year since the experiment began. Lime being a slow-acting agent, little benefit was expected during the first year, but since the second season the returns from these plots have consistently shown an increase in favour of liming. Assuming that the lime had little effect during the first season, namely, 1925-26, the yields obtained that year may be regarded as indicative of the natural fertility of the soil previous to the commencement of the experiment, and the difference between the total yields for the past three seasons and those of 1925-26 will reveal the effect of the treatment. The results of these trials are shown in the following table.

Yields of Maize in Bags per Acre.

Treatment.	Average of 2 series. 1925-26.	Total yields, 1927-29. Average of 2 series.	Difference.
One ton of lime per acre	21.3	47.7	26.4
Half-ton of lime per acre	24.7	52.45	27.75
No lime	20.6	37.22	16.62

These returns show that the plots which received lime have yielded considerably heavier crops, following the treatment, than those which had no lime. The reason why the half-ton plots have given better returns than the one-ton plots is not very apparent, but the yields for 1925-26 indicate that the natural fertility of those plots which received the half-ton dressing was rather higher at the time the experiments began than that of the one-ton and no-lime plots. Because in other experiments it has been shown that the yields on soils of low fertility decline more rapidly than those on soils of high fertility, it is thought that the effect of the lime is more accurately reflected by the yields of the plots which received one ton of lime than by those to which the half-ton dressing was applied. In these latter returns, over a period of four years, a total increased yield of nearly ten bags of maize has resulted from the application of one ton of lime per acre. In view of the fact that many previous experiments have failed to disclose any beneficial effects from lime, it was thought advisable to extend these trials, and two more series were arranged on a more elaborate scale. Two portions of land which were carrying maize during the season 1927-28 were sub-divided into plots and the yield of each plot was recorded. In each series one half of the plots were dressed with lime in July, 1928, while the other half of the plots remained unlimed. The higher yields of maize obtained on the limed plots may therefore be assumed to be due to the effect of the liming. In the season 1927-28 the average yield on twelve plots which were subsequently treated with one ton of lime per acre was 16.72 bags per acre, while the average yield on the twelve unlimed control plots was 17.42 bags per acre. In the year following the application of lime (1928-29) the yield on all of these plots was considerably lower than that of the previous season, but that on the twelve limed plots averaged 12.27 bags per acre, as against 10.57 on the twelve

unlimed plots. These returns seem to show that in spite of the usual slow action of lime, in this case it had a beneficial effect during the first season.

In the second of the new series of trials on a block of sixteen plots, arranged after the manner of squares on a chess board, alternate plots were dressed with lime, four receiving half a ton and four one ton of lime per acre. The following tabulation shows the average yields of the plots under different treatments before and after the application of lime.

Yields of Maize in Bags per Acre.

Maize yield, 1927-28 (before liming)	Maize yield, 1928-29 (after liming)		Difference
8.48	1 ton lime (average of 4 plots)	8.37	– 0.11
8.56	½ ton lime (average of 4 plots)	7.70	– 0.86
8.27	No lime (average of 8 plots)	6.77	– 1.50

In this case also, the actual yields obtained this season are slightly lower than those of the previous year, but it will be seen that whereas the amount of maize reaped on the plots which received one ton of lime is practically equal to that obtained the year before, the yield from the unlimed plots decreased by 1½ bags per acre.

In these experiments therefore—which are being conducted on numerous plots and under different conditions of soil fertility—in nearly every case an increased yield has been obtained from the limed plots, even when—as in the new series—the lime had been incorporated with the soil for such a short period as a few months only. From the results of these experiments it appears that under certain conditions applications of lime may have beneficial effects on the land. But since numerous previous trials, both at this station and in other centres in Southern Rhodesia, have failed to show increased yields through the liming, these more recent trials may merely indicate that while the virgin soil on formations similar to that of this station contains sufficient lime to meet the requirements of maize and other crops for a period of

ten to fifteen years, yet the natural stores of lime are gradually depleted and artificial dressings become necessary after such a lapse of time.

It is thought that land which has been cultivated for a number of years, and particularly land which has been induced to yield heavily through the application of fertilisers and green manures, will probably be benefited by periodical dressings of lime or wood ashes at the rate of a half to one ton per acre. But before the liming of extensive areas is commenced, farmers are advised first to experiment on a reasonably small scale and to bear in mind that the reward to be won from such treatment is only likely to be fully realised after a period of three to four years has elapsed.

GROUND NUT VARIETY TRIALS.

The number of varieties under trial has now been reduced to the three kinds which previous experiments have shown to be the heaviest croppers. These possess distinctive characteristics and will be kept as standard varieties for comparing with other new varieties or strains which may be introduced from time to time. Duplicate plots of each of these kinds were sown last year and the following results were recorded:—

Yields in lbs. per Acre of Unshelled Nuts.

Variety.	Season 1928-29.	Average over 5 years.	Average over 6 years.
Jumbo (runner) ...	2,510	2,440	2,452
Virginia bunch ...	2,490	2,096	2,162
Spanish bunch ...	1,450	1,714	1,670

All the Spanish bunch nuts grown at this station during the season under review suffered rather severely from a fungoid disease which attacks the leaves and stems of the plants, causing premature leaf-fall, and probably thereby reducing the crop of nuts to some extent. The other varieties, particularly the Virginia bunch, appear to possess greater powers of resistance, and farmers whose crops are consistently reduced by this cause may find in the Virginia bunch a more suitable variety. If a change is contemplated, however, it should be remembered that the Virginia bunch requires a somewhat longer growing season than the Spanish, and for that reason it should be planted comparatively early to secure

the best results. Another point in favour of the Virginia bunch is the large size of its kernels, which for certain purposes in the confectionery trade are preferred to the smaller nuts of the Spanish bunch.

POTATO TRIALS.

Green Manures for Potatoes.—It is well known that this crop demands an open soil which admits air and moisture freely and allows the growing tubers to develop without hindrance. Besides supplying plant foods, applications of farm manure and green manure improve the mechanical condition of the soil.

Under Rhodesian farming conditions the supply of farm manure is often limited, and these investigations were commenced four years ago to determine the extent to which the ploughing under of green manure crops would benefit the following potato crop. In these trials velvet beans and Sunn hemp have been grown as green manures, and oats for hay or seed are grown on an intermediate plot. A light dressing of farm manure—six tons per acre—is given to all of the plots during the winter months, and 200 lbs. of bone and superphosphate is distributed along the furrows at planting time.

The following table shows the results of these trials, omitting season 1927-28, when the crops were very seriously damaged by insect pests.

Potato Yields in Bags of 150 lbs. per Acre.

Treatment.	1925-26.	1926-27.	1928-29.	Average over 3 seasons.
Velvet beans ploughed under ...	93.7	92	62	82.9
Sunn hemp ploughed under ...	87.7	93	57	79.2
Oats reaped	77.8	84	62	74.6

These trials have not given as decided evidence in favour of green manuring as might be expected. The increased yields recorded as a result of green manuring are within the limits of experimental error. The reason for the comparatively small response is not easy to explain, but it is suggested that a contributory cause may have been that the green manure had not sufficiently broken down to benefit fully the early maturing potato crop. Each year tubers have been

planted during early November and the crops have matured in the following February.

In future, planting will be delayed until December, by which time the green manure will have had more time to break down and to become readily available for the use of the potato crop.

Size of Seed Trials.—Here tubers of three different sizes were used, and were taken from a bulked crop raised from seed which had been grown in Rhodesia for six seasons—always as a summer or rainy season crop. The large tubers weighed about 3 ozs. each, those classed as medium weighed 2 ozs. each, and the small ones weighed 1 oz. each. Quadruplicate plots were planted with each of these grades of seed. The average yields of each series of four plots and the proportions of different sized tubers are given in the following table:—

Yields per Acre in Bags of 150 *lbs. each.*

Size of parent tubers.	Size of progeny. Large.	Medium.	Small.	Total yield.	Percentage of large tubers to total yield.
Large ...	37.0	15.6	7.4	60.0	62
Medium ...	23.2	13.0	5.0	41.2	56
Small ...	11.6	9.6	6.8	28.0	41

These trials corroborate those of previous years and show that the large seed yielded considerably higher crops than the medium sized seed, and more than twice as much as the small seed, and moreover, that the large seed gave a much higher proportion of marketable tubers than the other grades. These returns support the view previously expressed that when seed tubers are taken from a bulked crop whose productive capacity has not been kept to a high level by a careful selection, better results are likely to be obtained from tubers which are rather larger in size than those usually recommended for seed purposes. The reason for this is probably that in most cases the productivity of potatoes rapidly decreases after their first importation into this Colony, and that by the use of small tubers for seed purposes the degenerative strains are propagated, while the desirable large-tubered strains are gradually eliminated. It is thought, therefore, that the results obtained in this experiment are not entirely due to the actual size of the seed tubers, but that the yields have been influenced by

hereditary characteristics as well. It must be remembered that the results of this experiment are only applicable under conditions which are similar in all respects (that is, when the tubers are all taken from the same strain, after it has been grown in this Colony for a number of years). It is highly probable that small tubers of a newly imported heavy bearing strain would give heavier yields than large tubers from a crop which had degenerated through not having been kept to a high productive standard by rigid selection with that end in view.

SWEET POTATOES.

The provision of succulent winter feed receives increased attention year by year from owners of farm live stock, who realise the necessity for the provision of a substitute for green fodder during the dry season. Other succulent crops such as pumpkins and melons are commonly grown, but in some seasons these crops fail to give the expected returns and cannot therefore be relied on. The sweet potato crop seldom, if ever, fails, and when established it will yield crops of tubers and green tops for at least two seasons. Except on land of high fertility, heavy crops of tubers are not obtained after the second season. The sweet potato provides a regular supply of succulent fodder over a period of several months. The tops may be used in the green state during the late summer and autumn, and their period of usefulness may be extended by preserving them in the form of hay or using them for silage or grazing before they are killed by frosts. When they are to be used for silage—on account of their high moisture content—they should be cut and allowed to wilt in the field for about ten days before being ensiled. This excess of moisture is sometimes utilised for correcting the lack of water in maize plants which have become too dry for silage making. When used in this way, the maize stalks and sweet potato vines should be well mixed together during the process of filling the silo, or if more convenient, they may be packed in the silo in alternate layers, but the layers should not be more than a few inches thick.

The tubers provide succulent food during the winter months. These are relished by all classes of live stock and are available for use from May to October, after which they sprout and produce an abundance of green tops, which may be

used again for feed or for propagation purposes. A continuous supply of succulent food, extending throughout the whole year, can be obtained from a well-managed field of sweet potatoes.

In view of the suitability of this crop for local conditions, many varieties have been introduced to this station. Among these the Early Butter, Calabash Leaf and Common Pink have consistently yielded heavy crops, and are regarded as the best of the many which have been thoroughly tested. The Calabash Leaf variety produces an abundance of vines, but rather fewer tubers than the other kinds. The Early Butter variety does not yield such a heavy crop of vines as the Calabash Leaf, but at this station its production of tubers has been more consistent and more abundant than that of the others. The Common Pink gives a heavy crop of tubers, but considerably less vine than the other kinds.

Three new varieties, namely, Southern Queen, Porto Rican and Yellow Jersey, appear this season for the first time in our variety trials. These were received through the courtesy of Mr. Kapnek of Glendale, who imported them from the United States of America.

SWEET POTATO VARIETY TRIALS.

Yields in lbs. per Acre.

Name of variety.	Average weight of tubers over 7 years.	Average yield of green tops over 7 years.
Early Butter	17,213	15,730
Calabash Leaf	13,566	18,413
Common Pink	17,189	12,594
Red Nancemund	12,390	15,440
	over 4 years	
Linslade	16,304	17,967
	over 3 years	
Oklahoma	7,940	17,400
	over 1 year	
Yellow Jersey	17,781	10,148
Southern Queen	13,965	13,459
Porto Rican	10,605	15,566

With the object of finding whether it is likely to be profitable to allow the volunteer crop, which appears in the second season, to reach maturity, part of each variety trial plot

during the past four years has been allowed to remain down to produce a second crop. Although the yields of the volunteer crop are not usually as heavy as those of the first season and the tubers are smaller, satisfactory results have been recorded. Under practical farming conditions, particularly if the land was weedy, less favourable results might be obtained, but the difficulty with weeds can be largely overcome by thoroughly discing the field in early December, soon after the first crop of weeds appears. Harrowing in this way may temporarily destroy the vines, but these would soon sprout again from below the ground and produce a luxuriant growth which would effectively compete with later crops of weeds.

It has been noticed here that the foliage of the volunteer crop is more frequently attacked by insect pests than that of the first crop, and this fact provides a further reason for not keeping the potato field down for more than two seasons.

SWEET POTATOES: VOLUNTEER CROP.

Yields of Tubers in lbs. per Acre.

Name of variety.	1st year's crop for comparison, 1927-28.	Volunteer crop, 1928-29.	Average 3 previous seasons' volunteers, 1925-27.	Average of 4 seasons' volunteer crops.
Early Butter	20,760	12,012	11,569	11,679
Common Pink ...	19,640	12,312	10,006	10,583
Calabash Leaf ...	14,784	6,016	5,660	5,749
Red Nancemund ...	10,860	5,400	6,542	6,257
Linslade	20,360	11,296	8,809	9,638
Average of all varieties	17,281	9,407	8,517	8,781

These returns show that the yield of tubers from the second crop may be expected to be about half as much as that of the first crop, and since the yield of green tops in the second year is about equal to that of the first, the total yield compares well with the first crop. Further, as it can be obtained at a very low cost, it appears to be good practice to allow the second crop to mature.

(*To be concluded.*)

Low Concrete Dams.

By R. Hamilton Roberts, B.Sc. (Eng.), Assistant Irrigation Engineer.

Several distinct types of structure will be described in this article, each suitable for certain conditions and all designed with a view chiefly to securing the greatest simplicity and economy of construction as far as may be consistent with strength and effectiveness. It is hardly necessary to state that all concrete dams must be founded on, and anchored to, sound, solid rock, but the nature of this rock will influence the method of achieving the desired object. For low walls, a cheap and efficient system is that of cementing stout steel bars into holes "jumped" into the rock at frequent intervals, and this is illustrated in the accompanying drawings. For higher dams it is safer to chip (not blast) furrows or "berms" in the rock face, so as to leave a rough surface with which the concrete may form a secure union.

It is impossible in the scope of this short article to give a complete specification for concrete work, and reference should be made to standard text books or to the article entitled "Concrete on the Farm," which appeared in the *Rhodesia Agricultural Journal* for April, 1926, and was reprinted as Bulletin No. 588. Further detailed or special advice will readily be given by the Irrigation Division on application.

Movable Dam.—In many parts of the Colony trouble is caused by dams gradually filling up with silt brought down by floods, and in such cases a movable dam is a convenient solution of the difficulty. A suitable type is illustrated in Fig. 1, in which it will be noted that the dam consists of concrete piers, the gaps between which are filled by baulks of timber, sliding in channel-iron uprights set in concrete. At the on-

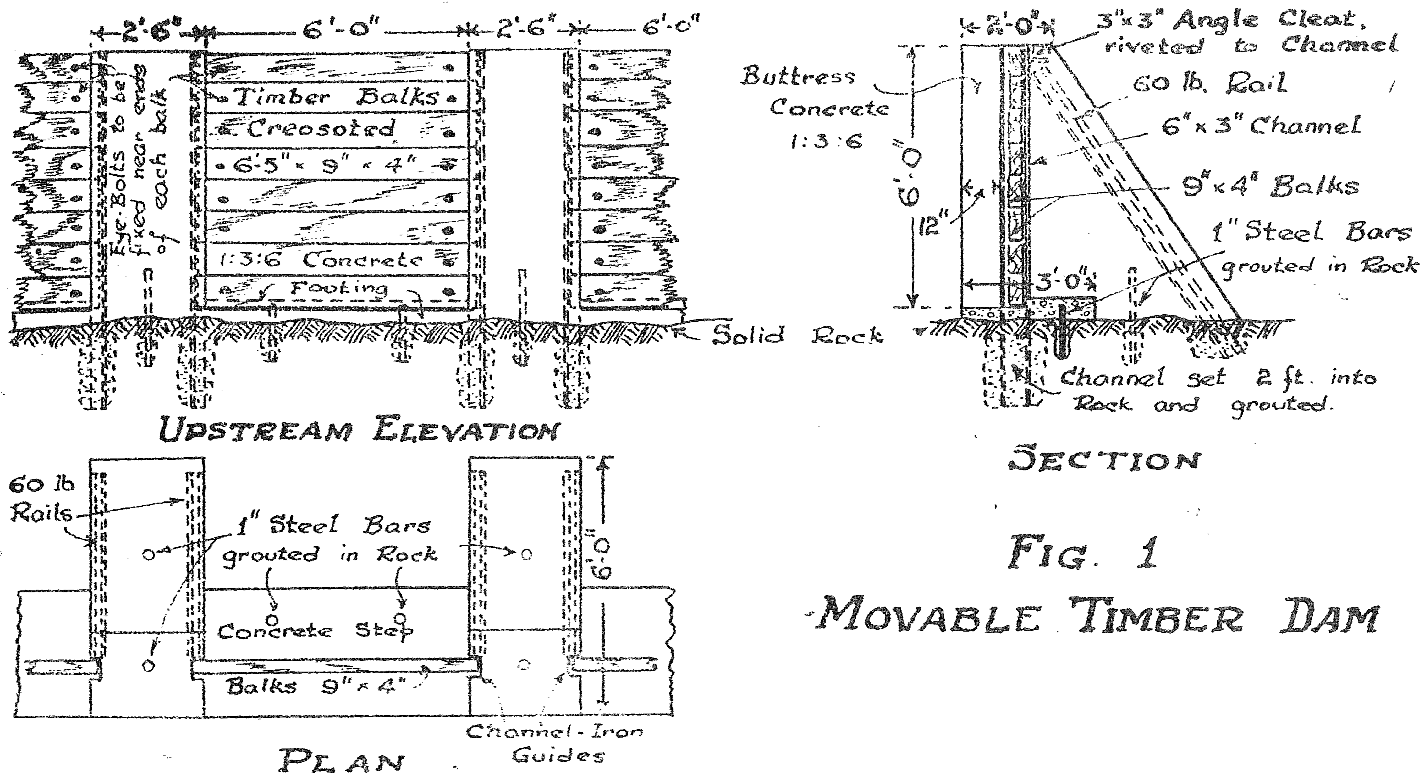


FIG. 1
MOVABLE TIMBER DAM

set of the rains the baulks are lifted out (by means of eye-bolts at each end), thereby allowing the flood to sweep freely through the openings and carry silt and debris clear away. Towards the end of the season the baulks are replaced, to permit the dam to fill with water relatively free from silt. The joints between the baulks are made water-tight by means of strips of hessian or tarred felt nailed to the timbers. The baulks should be creosoted, and the hessian or felt should be tarred. The design of this dam is such that the load on the baulks is taken by the channel-iron uprights and not by the concrete buttresses. It is essential, therefore, that the channels should be set deep into holes blasted in the rock and securely cemented into place, with 1 : 3 cement mortar. Any cracks opened by the blasting should be filled with cement grout. The upper end of the channel-iron is braced by a 60 lb. rail set in the concrete and let into the rock. Instead of a 60 lb. rail a length of 3 in. x 3 in. angle iron may be used. The dam is designed to withstand a flood 2 feet deep over the crest, so that it will be dangerous to leave the baulks in position in times of severe flood. The quantities of material for the principal items in a unit section of a 6 foot dam are as follows:—

Concrete, 3.37 cub. yards ($7\frac{3}{4}$ bags of cement).

Channel-iron, 6 in. x 3 in. x 14.5 lb./ft., 2 lengths of 8 feet.

Baulks, 9 ins. x 4 ins., 8 lengths of 6 ft. 5 ins.

60 lb. rails, 2 lengths of 8 ft.

The cost per foot will be about £2 11s. (see Table 5), based on concrete at 40s. per cubic yard, steel at 4d. per pound and baulks at 2s. 8d. per foot, together with estimated labour costs.

Reinforced Slab Dam.—The principle of this design is that steel joists of suitable size are cemented into deep holes 5 feet apart, and receive the load from relatively thin panels of reinforced concrete. It will be seen that it is essential for the rock to be absolutely sound and strong, since complete reliance is placed on it, and therefore it is advisable to limit the height of the dam to about 8 feet. Up to this point, however, the design is extremely flexible, and by

selecting joists of suitable strength the dam may be designed for a wide range of conditions. The dam has the advantages of great economy and simplicity, since it lends itself to rapid and easy construction. The joists are first erected, truly vertical and in line, and the 3-8th in. horizontal reinforcing rods, in 5 ft. 3 in. lengths with the ends screwed, are passed through holes drilled 4 ins. apart in the webs of the joists and bolted tight, so that the reinforcing material in each section forms a rigid structure by itself. The ¼ in. vertical rods are wired to the 3-8th in. rods at the correct spacing. Timber shuttering (in sections 2 feet high) is then bolted to the joists and set to the proper distance apart; it is advisable not to attempt to pour a greater depth of concrete than 2 feet in one operation, but as soon as one "pour" is complete, the next upper section of shuttering should be set in place and concreting continued.

Sufficient sets of forms should be available in order that a complete panel may be poured in a day and the shuttering left undisturbed for a week.

The design lends itself to concrete being placed in short complete sections, and hence, if time is not important, only three or four sets of shuttering may be required.

Designs have been prepared for two heights of dam, 5 feet and 8 feet, and the quantities for a 5 foot length of each are as follows:—

TABLE 1.

Material.	5 foot dam.	8 foot dam.
Steel joist ...	7 ft. long, 9 ins. x 4 ins. x 21 lb./ft.	10 ft. long, 12 ins. x 6 ins. x 44 lb./ft.
Concrete	0.46 cub. yard	1.0 cub. yard
Cement	1½ bags	3 bags

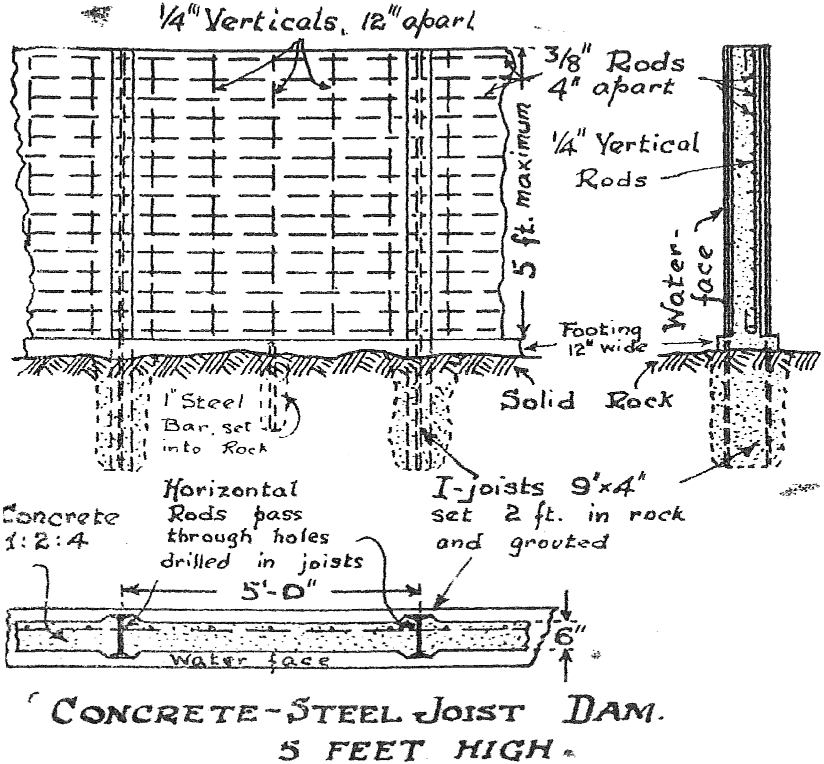
The slab is 6 inches thick for the 5 foot dam and 7¼ inches thick for the 8 foot dam.

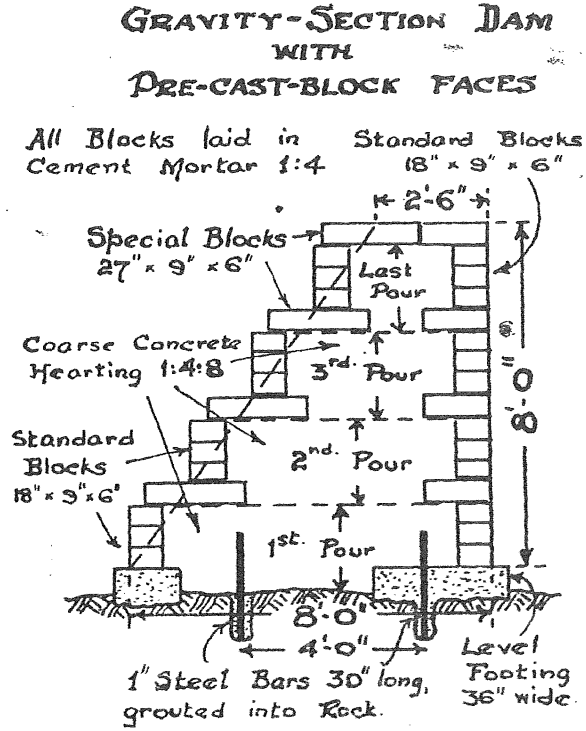
The costs per foot, assuming concrete at £5 per cubic yard and steel at 4d. per pound, will be respectively 24s. and 56s. (see Table 5).

It will be seen that this is an extremely cheap form of dam, besides being simple to construct. As substitutes for the steel joists, pipes and 60 lb. rails were considered; pipes were found useless, but the rails may be used in the 5 foot dam if spaced 20 inches apart. A saving in first cost will be made, but this is largely offset by the expense of the extra holes in the rock, and no saving can be made in the concrete, as 6 inches may be regarded as a minimum thickness.

Although absolute water-tightness is not guaranteed in this type of dam, it is a very economical form of construction, which will be found serviceable under a great variety of conditions, *e.g.*, for diversion weirs, where the whole of the stream flow is not required to be diverted; for storage of the normal flow for limited periods; and for soil erosion protection works, such as closing up of large dongas.

Gravity-Section Dam.—A dam of this type is illustrated in Fig. 3, and will be observed to differ from the usual concrete wall in one important respect, viz., that timber form work is obviated by the use of concrete blocks which are moulded prior to placing. It may be said that this design was somewhat disappointing, as it was hoped that a bigger saving would result from the abolition of the timber shuttering, but the dam still possesses commendable simplicity of construction, as it avoids the use of complicated timbering and requires no great skill in building. In passing, it may be said that this saving is more pronounced with dams of greater height, and does not show itself to the best advantage in a low wall. The blocks are 18 in. x 9 in. x 6 in., of 1:3:6 concrete, and should be easily handled, as the weight will be about 85 pounds each; they may be cheaply cast in simple, inexpensive wooden moulds. For the downstream face a certain number of "special" blocks 27 inches long are required, in order to project well into the "hearting." This "hearting" consists of coarse 1:4:8 concrete, containing, say, 20 per cent. of "plums" (large stones, 6 or 9 inches diameter). The method of pouring this concrete is illustrated in the drawing. Three courses of "stretcher" blocks are laid in 1:4 cement mortar, and then the "hearting" is placed and finished off level with the


1/4" Verticals, 12" apart
3/8" Rods
4" apart
5 ft. maximum
1/4" Vertical
Rods
Water-
face
Footing
12" wide
Solid Rock
1" Steel
Bar, set
into Rock
I-joists 9'x4"
set 2 ft. in rock
and grouted
Concrete
1:2:4
Horizontal
Rods pass
through holes
drilled in joists
5'-0"
6"
Water face
CONCRETE-STEEL JOIST DAM.
5 FEET HIGH.
Fig. 2.


GRAVITY-SECTION DAM
WITH
PRE-CAST-BLOCK FACES
All Blocks laid in
Cement Mortar 1:4
Standard Blocks
18" x 9" x 6"
2'-6"
Special Blocks
27" x 9" x 6"
Last
Pour
Coarse Concrete
Hearting 1:4:8
3rd. Pour
8'-0"
Standard
Blocks
18" x 9" x 6"
2nd. Pour
1st. Pour
8'-0"
4'-0"
1" Steel Bars 30" long,
grouted into Rock.
Level
Footing
36" wide
Fig. 3.

top course. A course of "header" blocks is then laid, and three more courses of "stretchers," and the "hearting" again brought up to the level. This method avoids the necessity of placing concrete underneath an over-hanging block, which may cause weakness owing to air spaces and the difficulty of proper ramming. Great care must be taken that the surface of concrete should be chipped, cleaned and washed before placing new concrete on the top of it. It is necessary to build truly level footings on which to lay the blocks, and these footings must be properly "keyed" into the rock. A number of 1 inch steel bars must be cemented into holes jumped in the rock as shown; these pairs of bars should be spaced about 3 feet apart along the line of the dam. The approximate quantities of material are as follow (for 1 foot length of dam):—

TABLE 2.

Item.	8 foot dam.	12 foot dam.	15 foot dam.
Blocks 18 ins. x 9 ins. x 6 ins.	21	32	40
Blocks 27 ins. x 9 ins. x 6 ins.	5	8	10
Mass concrete ...	1.2 cub. yards	2.5 cub. yards	3.9 cub. yards
Cement	3.4 bags	6.2 bags	10.1 bags
Cost per foot	£4 2s. 0d.	£7 10s. 0d.	£11 2s. 0d.

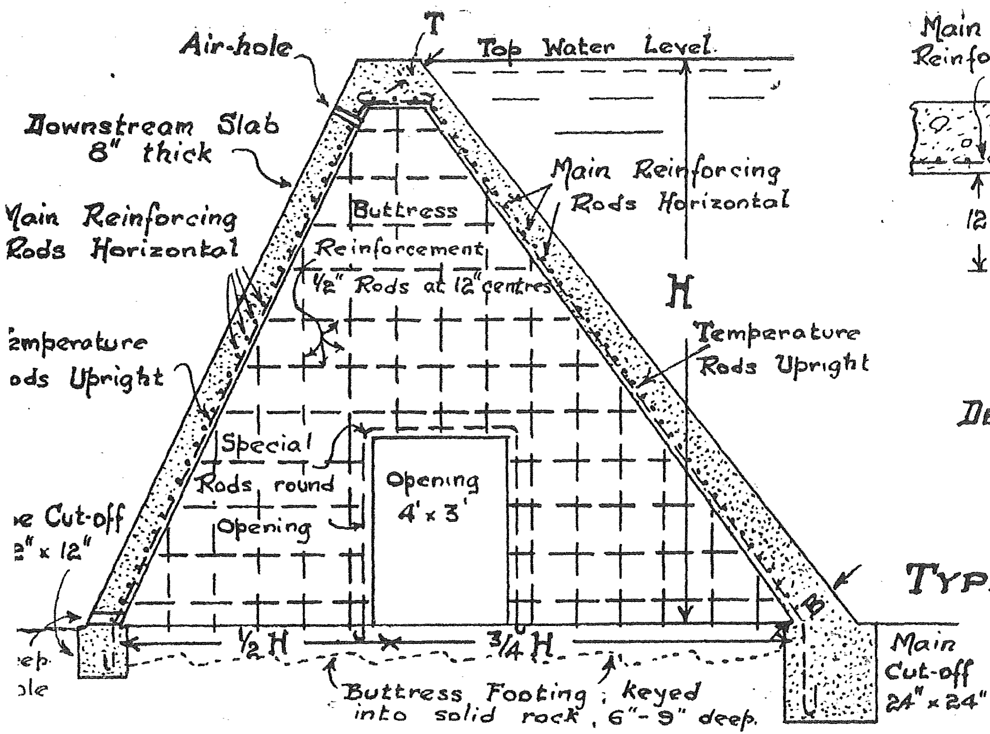
The above costs are arrived at by assuming that the blocks will cost 40s. per cubic yard (10d. each) and the mass concrete 35s. per cubic yard.

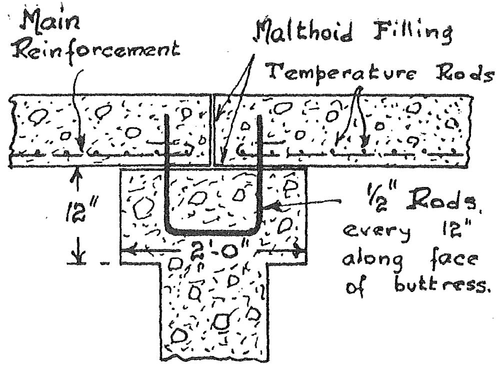
"Ambursen" Dams.—This type of dam is ingenious, in that it uses the very water it stores to increase its stability; and consequently possesses the advantages of lightness and a more uniform distribution of pressure on the foundations. It requires, however, a somewhat complicated system of timber form work, which naturally adds to the cost. It is uneconomical in a low dam, and therefore nothing under 12 feet has been considered in this article. The dam consists of sloping, reinforced slabs, set at an angle of 55 degrees

and supported by triangular buttresses at intervals. Since it is usually necessary to pass flood water over the crest of the dam, another slab is required on the downstream side. But if the dam is intended purely for storage, and provision can be made for disposing of flood water through a separate spillway, this second slab may be omitted, provided that the dam be built to an extra height of 3 or 4 feet. The buttresses are 12 inches thick at the top and increase slightly in thickness toward the bottom; the concrete is mixed 1 : 3 : 6, and though theoretically the buttress needs no reinforcement, it is advisable to include a 12 inch mesh of ½ inch rods. Each slab is a separate unit (to take care of expansion, and to simplify the placing of reinforcement), and a joint is made at each buttress, the face of which is thickened to a T shape, as shown in Fig. 4. The slab reinforcement is placed 1½ inches from the inside face. The spacing of the buttresses varies with the height of the dam, for the sake of economy; for a 12 foot dam the spacing is 9 ft. 3 ins., and for a 15 foot dam it is 10 ft. 9½ ins. The dimensions are as follow:—

TABLE 3.

Height of dam (maximum).	Top thickness of slab.	Bottom thickness of slab.	Bottom thickness of buttress.
12 feet	8 inches	14½ inches	15.6 inches
15 ,,	8 ,,	16½ ,,	16.5 ,,





DETAIL OF SLAB-JOINT AT BUTTRESS

TYPICAL "AMBURSEN" DAM
10-15 FEET HIGH

FIG. 4

The following table indicates the size and spacing of reinforcing rods:—

TABLE 4.

Position	12 foot dam	15 foot dam
Main rods in slab (horizontal).	Top 4 feet, $\frac{1}{2}$ in. rods (10 at $4\frac{1}{2}$ in. spacing). Next 8 feet, $\frac{1}{2}$ in. rods (27 at $3\frac{1}{2}$ in. spacing). Bottom 4 feet, $\frac{1}{2}$ in. rods (16 at 3 in. spacing).	Top 4 feet, $\frac{5}{8}$ in. rods (9 at 5 in. spacing). Next 8 feet, $\frac{5}{8}$ in. rods (24 at 4 in. spacing). Bottom 8 feet, $\frac{5}{8}$ in. rods (27 at $3\frac{1}{2}$ in. spacing).
Temperature rods (main slab).	$\frac{1}{4}$ in. rods, 4 in. apart.	Top 8 feet, $\frac{1}{4}$ in. rods 6 in. apart. Bottom 8 feet, $\frac{1}{4}$ in. rods 3 in. apart.
Main horizontal rods (downstream slab).	$\frac{1}{2}$ in. rods, 5 in. apart.	$\frac{1}{2}$ in. rods, 5 in. apart.
Temperature rods (downstream slab).	$\frac{1}{4}$ in. rods, 6 in. apart.	$\frac{1}{4}$ in. rods, 6 in. apart.
Buttress.	$\frac{1}{2}$ in. rods, 12 in. apart both ways.	$\frac{1}{2}$ in. rods, 12 in. apart both ways.

The costs of "Ambursen" dams, as given in Table 5, are based on the following prices: Slab concrete (1 : 2 : 4) £6 per cubic yard, buttress and footing concrete (1 : 3 : 6) £3 per cubic yard. These costs are purposely assumed a little on the high side, since it is unlikely that the work will be done by anyone but a skilled contractor. It is highly advisable that special advice and supervision should be sought before embarking on the construction of a dam of this sort, for each case requires careful consideration on its merits.

TABLE 5.

Summary of Quantities and Costs.

ITEM (per foot-length of dam)	5 foot dam		6 foot dam		8 foot dam		12 foot dam		15 foot dam	
	Concrete steel joist	Movable dam	Concrete steel joist	Movable dam	Concrete steel joist	Gravity (Fig. 3)	"Am-bursen"	Gravity (Fig. 3)	"Am-bursen"	Gravity (Fig. 3)
Concrete (cubic yds.)	0.09	0.37	0.12	0.40	0.20	1.79	1.46	3.37	1.91	5.10
Cement (bags) ...	0.31	0.83	0.44	0.91	0.60	3.37	4.3	6.2	5.6	10.1
Steel (lbs.)	36.0	23.5	57.0	28.2	98.0	...	97.0	...	142.0	...
Cost ... ... £	1 4 0	2 5 0	1 14 0	2 11 0	2 16 0	4 2 0	7 19 0	7 10 0	10 10 0	11 2 0

Talks to Poultry Keepers.

THE SELECTION AND PREPARATION OF FOWLS FOR EXHIBITION.

By H. G. Wheeldon, Chief Poultry Officer.

The exhibiting of poultry by members of poultry clubs or farmers should be regarded with some importance. Poultry shows, whether held exclusively for poultry or in conjunction with agricultural shows, are not only of much interest to the public, but they play an important part in the development of the poultry industry.

Selecting the Birds.—The selection of birds for exhibition should be done early. The first selection should be made carefully by observing the birds as they appear in the yard or on range. This should take place not less than a month before the date of the show. While making these observations the exhibitor should keep in mind the general characteristics of the breed or variety to be shown.

Every flock will include individual birds that are outstanding in appearance and which possess desirable type and colour of plumage. The more outstanding birds should be caught and carefully examined in detail. Note the defects and desirable points in conformation and the surface and under colour of the plumage, as described in the South African Standards of Perfection. In choosing the birds for exhibition remember there are no perfect fowls. The selection is largely a matter of picking those with the least defects and the most desirable all-round characteristics. Good head points are generally associated with good all-round qualities. It is not advisable to over-rate any one good point. Birds that possess any disqualifying defects for the breed or variety they repre-

sent should not under any circumstances be sent to the show. In addition to the standard requirements, the final decision should be given to those birds which are in good condition, that are vigorous and with good general appearance.

Training and Conditioning.—Birds that have been trained and properly prepared for the show will stand a better chance of winning in competition with other birds equally as good, but unattractive owing to soiled plumage and scaly legs.

The selected birds should be removed from the flock and placed in neat, clean, roomy coops for short periods of two or three days at a time, alternately, up to a few days before the show. They should then be confined until ready to be despatched. The birds should not be confined to the coops for long continuous periods, as this may cause them to lose condition and moult. Handle them gently, so as not to frighten them. Frequent handling in this way will have the effect of training birds that are wild or timid. When handling fowls hold the legs with the fingers of the left hand, and the breast bone resting on the palm of the hand, with the head of the bird towards the body of the operator. Take the bird out of the cage often and stroke the plumage and handle the wattles, lobes and comb with the right hand, as the judge would do. Open out the wings and change the bird from one hand to the other. When in the coop the birds should be gently touched or moved about with a light stick. If this is done frequently and properly, they expect it when one approaches, and on opening the coop the birds will readily step into the hands.

It is not reasonable to expect the judge to contend with birds that are wild or out of condition or infected with scaly legs and insect vermin or otherwise improperly prepared. Birds for exhibition should, to say the least, be well furnished, vigorous and in good condition, with lustrous plumage, clean bright headgear, legs and feet.

Small food utensils should be supplied for each coop and the birds fed in the usual way without overfeeding them. Encourage the birds to approach and feed out of the hands whenever convenient. They should be tempted with a little raw meat occasionally, which they like, and it will serve also to improve their condition.

Washing.—The birds should be washed two or three days before the date of showing or despatching. The plumage of the white varieties of fowls, such as the White Leghorns, White Wyandottes, Light Sussex and the buff and mottled varieties, should be washed. Dark coloured birds, such as Rhode Island Reds, Black Orpingtons, Barred Plymouth Rocks and Black Leghorns, need not be washed unless their plumage is considerably soiled. The head, feet and shanks, however, of all varieties should be properly cleaned. The actual washing of birds is not a difficult operation, and with a little practice the novice will soon become proficient in this work. Before attempting to wash the birds for exhibition, it would be advisable for the novice to take two or three other birds from the flock and wash them as described, so as to gain confidence and practice before washing those to be shown.

The birds should be washed in a warm room or building with a heater supplied if the weather is cloudy and cold, otherwise choose a warm, sunny day and wash them in a protected locality in the open. The washing should be done in the morning, so that the plumage will have time to dry well before the evening. The coops or hampers to be used for despatching the birds should be placed in a protected, sunny position in which the birds can be placed to dry after being washed. Clean shavings or straw should be placed inside the coop, and the top, back and two sides covered with hessian to protect the birds. The front of the coop should be open and exposed to the sun. Take three or four suitable receptacles to hold water and arrange them on a bench or platform of convenient height. Each bath should contain sufficient water to cover the body of the bird when immersed. If possible, clean rain water should be used—hard water may not give satisfactory results. The contents of the first bath is to be used for the actual washing and cleansing, second and third bath for rinsing and removing all the soap.

Lux or any white toilet soap may be used for washing. The water in the first bath should be heated to a temperature which is comfortable to the hand, and in the other baths it should be lukewarm. Add lux to the first bath and whisk into a lather. Then begin washing the legs, and if necessary, scrub gently with a nail brush. When the legs are clean, submerge the body of the bird to the base of the neck and

thoroughly soak the plumage to the skin. This is effectively done by lifting the feathers and gently rubbing the lather well into the various sections of the body. A small sponge will be a convenience in this respect, especially for cleaning the wing and tail feathers. If the feathers are badly soiled, a nail brush can be used with advantage. Wash the neck feathers and head, then remove the bird and squeeze out as much water as possible from the plumage. The bird may then be placed in the second bath and slowly swayed about with the object of removing the soap. Continuē by placing the bird in the third bath, and repeat the process to remove the remainder of the soap. A final rinsing may be given and then dry the plumage with a towel. The bird is now ready to be placed in the drying coop. A small quantity of washing blue might be added to the last bath to make the water sky blue in colour. This improves the appearance of light coloured birds. If the soap is not thoroughly removed it will cause the feathers to cling together or appear matted when dry.

The legs, comb and wattles should be treated when the plumage is thoroughly dry. A little vaseline or sweet oil may be gently rubbed into these sections, then wiped off or polished with a clean cloth. If too much vaseline or oil is used it will soil the plumage. In the case of birds with red ear lobes similar treatment is necessary as for the comb, but in the case of white ear lobes a little zinc ointment should be rubbed in. At night time the birds should be placed in a comfortable shed or room. A few drops of eucalyptus oil in the drinking water is beneficial after washing. An iron tonic such as Parish's Chemical Food or Eastern's Syrup given in the drinking water a day or two before the show will tone the system and redden the face and comb.

Despatching Birds to Show.—Comfortable, roomy, clean coops or poultry hampers should always be used. The floor of the coop or hamper should be bedded with fine, clean chaff, and in this place some finely cracked grain, grit and shell. If the journey is not a long one, a piece of beetroot or kaffir melon can be used instead of drinking water. This supplies all the liquid the birds require and will obviate spilling the water and soiling the plumage. If the journey is to be a long one, it will be necessary to place some water in a receptacle

firmly fixed to the side of the coop well above the litter. A piece of cabbage or lettuce may be hung in the coop for the birds to peck at. Address to the secretary of the show and label the crate, "Valuable live birds—with care," "Deliver immediately," or "Urgent."

If the exhibitor accompanies his birds to the show, advantage could be taken of the opportunity to touch them up before penning. In addition to the feeding by the show authorities, it is advisable to give a little fresh meat and some chopped onion each day; the former will tend to balance the rations and the latter to prevent a chill. If the birds catch cold, give a quinine pill (2 grains) night and morning.

Treatment after Show.—As soon as the birds return from the show, examine them carefully, and if they seem out of sorts, treat accordingly. Always keep the birds isolated in a dry, warm place for a few days before putting them back in their pens. This treatment should always be carried out, for it frequently saves trouble and expense.

Extracts from the Report of the Chief Native Commissioner

FOR THE YEAR 1929.

Afforestation.—Afforestation in reserves is fostered through Native Reserve Trust Fund assistance, but depends necessarily on individual care and enthusiasm. Instances of progress in this regard are the planting of 10,000 trees in Zwimba Reserve under the direction of Father Loubiere; the establishment of five plantations (187,000 trees) in Chilimanzi through the unselfish enterprise of the Jesuit Fathers at Driefontein; 26,000 gum trees at dip tanks in Gutu Reserve; and 12,000 gum trees planted in Selukwe Reserve. In Marandellas and Charter districts afforestation has for some years past been prosecuted and shows progress.

Live Stock.—Abundance of grazing and freedom (except in one district) from East Coast Fever have marked the

year. Cattle, both in Matabeleland and Mashonaland, have thrived. In native agriculture Mashonaland attracts first attention, but in pastoral pursuits Matabeleland has pride of place, both because of her better grasses and the superiority of Matabele as stockmen. But the Matabele are too self-satisfied on this score and not as open to suggestions for improvement as are the Mashona. Their rigid conservatism in respect of cattle is not unsupported by reason. They aim at hardiness and get it. But in market values the despised Mashona stock are already, through better bulls, approaching the Matabele cattle, and threaten to surpass them at no distant date. In addition to those acquired by individuals, there are now 3,151 grade bulls serving native cattle. The Matabele are less content than are the Mashona to leave the selection of their bulls to officials. Their acquisitions are therefore mostly through private purchase. They are not only more individualistic in this matter, but they have the affection of true pastoralists for their cattle. The elimination of scrub bulls goes on satisfactorily. The total number of cattle sold is reported to be 59,214, of which 10,930 are reported from Gwanda district alone. The natives of this district are driven through scanty rainfall to depend for a living mainly on their cattle, which bear a relation to the population (man, woman and child) of between four and five to one.

The following is a statement of native-owned stock for the past two years:—

	1928.	1929.
Horned cattle	1,420,913	1,495,803
Sheep	279,678	268,251
Goats	792,440	771,011
Pigs	47,350	37,889

Agriculture.—The harvest reaped in 1929 was in practically all cases below the average in varying extent. The staple cereals, rupoko (rukweza), nyawuti (munga) and mabele (mapfundi), fared better than maize, which, as a commercial crop, is increasingly grown. Speaking generally, there was an ample food supply and a fair margin for trade. The use of ploughs is only prevented from becoming universal by lack of oxen, as in a fly-infested locality. The drawbacks of the plough, as a substitute for the hoe, are drawn attention to by many Native Commissioners. I select

two comments: one, the pithy statement of the Native Commissioner, Mazoe, that "the plough instead of the badza is used to scratch the ground"; the other is from the pen of the Native Commissioner, Mrewa, who says:—

> "It will be several years before the use of the plough by the natives can come to be considered an improvement on their own method of preparation of the soil for crops; the ploughing is in most cases badly done, especially in lands where stumps have been left, and they very often select land to be turned over by the plough, just because there are no trees in it, that would have been considered a waste of time to turn over with the hoe. To see two lands alongside each other, on the same granite soil, dotted with tree stumps, land being put into cultivation for the first time, the one turned up with the plough and the other with the hoe, is an object lesson. In the one done with the hoe the contour of the ground has been studied, and the ridges made with a view to draining the lands from the heavy floods, but still more to prevent erosion; the crop stands high and dry in the heaviest rains, and gets all the benefit of the humus turned under between the sods which form the ridge. The other is a scarified piece of ground, the half-turned drills running in circles or straight lines, depending on the stumps, no thought being given to flooding, wash or anything else, patches of grass left where they could not get the plough to work, the crop existing where it can."

It is hoped that sound agricultural guidance will, through demonstration, surmount the difficulties that confront the husbandman in his transition from the hoe to the plough. Such guidance is badly wanted, as ploughs at present are a doubtful advantage.

It is estimated that 727,885 bags of maize were harvested, and that 197,000 bags were sold to traders and others, together with over 100,000 bags of other grain and products. These figures are approximate, but in most cases the estimate is arrived at on a basis of information from traders. The production and marketing of maize by natives in a Colony which annually exports a considerable quantity —grown by European farmers—threatens to become a serious problem.

Maize for Export.

WARNING TO GROWERS.

At the last annual maize export and grading conference, held on the 14th April, 1930, it was recommended that the Department of Agriculture should again issue a warning to all maize growers in the Colony, drawing attention to the requirements of the maize export regulations. Although these regulations are quite explicit, and repeated warnings have been issued in the past, many growers still disregard their meaning, with the result that difficulties due to excessive moisture of the grain, quality of the sacks, methods of sewing and so forth, which could be avoided, still occur at the commencement of every grading and export season.

Shelling often seems to be unduly hastened before the grain is sufficiently dry to permit of it being bagged with safety. Many growers appear to rush their maize to the railways early in the season, quite regardless of whether it is in a fit condition for export or not, and apparently without taking any steps to ascertain that the moisture content is such as will permit of it being at once graded. If the moisture content exceeds 12½ per cent. in any of the bags, the whole consignment must be temporarily rejected for export, no matter how good the grain may be in other respects.

The principal causes for wet maize being delivered to the railways are:—(a) Cutting and stooking before the crop is fully mature and mixing in the dump unhusked ears from the stooked crop amongst drier ears harvested later from the standing crop; (b) building the dumps of unhusked ears too large, so that little, if any, further drying out of the grain takes place prior to shelling; (c) reaping the whole crop of unhusked ears before the grain is sufficiently dry.

The following extracts from the regulations are published here in the hope that growers will give greater attention to this matter and will thereby save themselves much trouble and annoyance through their maize being rejected for export on account of an unduly high moisture content or failure in other respects to comply with the regulations.

Requirements in Respect of Bags.—"All maize intended for export shall be contained in new $2\frac{1}{4}$ lb. A quality 8 x 8 twill bags."

In many cases new bags of this standard are bought, but are used too often on the farm in the harvesting operations before being subsequently utilised for bagging the maize for market. This practice is responsible for a large number of the bags which are rejected for export. Growers are warned that the Government graders have no option but to reject any bags which show undue signs of previous use or of weakness.

Sewing of Bags for Export.—"All bags shall be properly sewn at the mouth, the stitches being through the hem of the bag and being not more than one inch apart. All bags shall be sewn without lugs, and five-ply double twine of good quality shall be used for sewing the bags."

This regulation applies also to maize or maize meal not only for export overseas, but also for export overland to any other part of Africa—a point which sellers should not lose sight of. Maize or meal consigned to any point outside the boundaries of Southern Rhodesia is deemed to be exported, and must therefore comply with the regulations.

The farmer has no means as a rule of knowing how the buyer will utilise the grain. It may be milled locally or may be required to be exported overseas or overland, and it is therefore advisable that all bags should be sewn without lugs, irrespective of whether it is thought they are intended for export or for local consumption.

Standard Moisture Content of Maize for Export: Harvesting and Shelling.—"No maize shall be permitted to be exported which contains more than $12\frac{1}{2}$ per cent. of moisture."

For several years great difficulty has been experienced at the commencement of each export season by reason of

the large amount of damp maize offered for railing, and large consignments have annually been temporarily rejected by the Government graders on this account. The bagging of damp maize renders the export trade very difficult, *and rejection causes much extra expense and annoyance to the owner of the grain.* As a rule, it is found that where wet maize occurs in the consignment all the grain is not uniformly wet, but some bags are wet and others dry, or perhaps part of the contents of a bag is dry and part still unduly moist.

The following suggestions are offered with a view to assisting producers to make sure that their grain is in a dry condition when delivered for grading:—

1. Before and after shelling, the grower should examine the ears of grain, and by breaking the kernel or thrusting the thumb-nail into the germ, should ascertain the degree of moisture still present. If the thumb-nail will penetrate the germ of the grain with difficulty, then the maize is just dry enough for export. However, the grain in a sample of maize is never uniformly dry, and a number of grains from each bag must be tested to arrive at a true estimate of the moisture content of the whole sack.

2. If there is doubt of the moisture content of the shelled maize, samples of the grain should be submitted to the Department of Agriculture for test before commencing to ride the consignment to the railway. *Such samples should be representative of what is regarded as the most moist maize in the consignment,* and should be drawn direct from the bags and placed at once in air-tight tins, which should be posted to the Department immediately. The weight from each consignment should be about two pounds.

3. The mixing of early and late reapings in one large dump should be avoided. The first maize harvested should generally be kept in a distinct dump from later reapings. The size of dumps should not be too large, and, depending on the condition of the maize, should be regulated so as to permit, if necessary, of the grain drying out after being placed in the dump. *Where the dumps contain several thousand bags of cobs, the grain in the lower layers of unhusked ears will hardly dry out at all during the whole period it remains in the dump.*

4. The maize in some parts of a field often ripens more slowly than in others. When such conditions obtain, special precautions are advisable to reap the two separately and keep them in separate dumps.

The ears from a crop which has been cut and stooked early before it is quite dry can with advantage later be husked from the stooks instead of being reaped unhusked.

The ears from early reaped crops which are known to be not quite ripe are better husked and left for a few days exposed to the sun to dry before being shelled.

5. If there is any fear that the grain is still unduly moist after shelling, *the bags should be stood upright around the threshing ground.* This will allow free circulation of air and considerably hasten drying.

6. Maize stacked at the railway lines or on farms should be placed on suitable and ample "dunnage," such as maize cores, timber or steel sleepers, as a protection against white ants, and more particularly to check absorption of moisture by the bottom rows of bags and allow of circulation of air below the stack.

7. Shelling should not be commenced until the farmer is satisfied that the grain is sufficiently dry. The tendency of certain growers to rush damp maize upon the market before it is in a state fit for export has been very obvious in the past.

8. *The stooks of maize should not be circular in plan, but rectangular,* as is the practice in stooking cereals in Great Britain. The tops of the plants should be placed together and the butts spread at least a yard apart, so as to leave a space through the inside of the stooks to allow the circulation of air. The stooks should be made as small as possible.

It rests with the producer to see that his grain is offered for sale or export in a fit condition to comply with the requirements of the trade, and if he fails to do so he has no one to blame but himself.

It is sincerely hoped that this warning, together with the suggestions which have been offered, will have the effect of inducing maize growers to give more attention to these matters and to save themselves much worry and unnecessary loss.

Copies of the maize export regulations can be obtained

Summary of the Game Laws of Southern Rhodesia.

Owing to changes which have been effected in the Game Laws and in consequence of requests for information, the following is published in a summarised form.

Close seasons for game are:—

1. Ordinary game.—

   Mashonaland: (a) Birds, from 1st October to 30th April; (b) antelope, from 1st November to 30th April.

   Matabeleland: Birds and antelope from 1st November to 30th April.

2. Special game—throughout the Colony—from 1st December to 30th June.

Definitions.

Ordinary game.—Duiker, steinbuck, Sharpe's steinbuck (locally known as grysbok), oribi, klipspringer, warthog, francolin (including pheasant and partridge), sand grouse (Namaqua partridge), guinea-fowl, dikkop.

Special game.—Buffalo, zebra, reedbuck, bushbuck, koodoo, sable, waterbuck, lechwe, pookoo, impala, tsessabe (in the native districts of Sebungwe, Lomagundi, Wankie, Insiza, Belingwe, Chibi and Gwanda only), Lichtenstein's hartebeest (in the native districts of Ndanga and Bikita only), gnu or wildebeest.

Royal game.—Elephant, rhinoceros, hippopotamus, giraffe, eland, roan, gemsbuck, inyala, sitatunga, Lichtenstein's hartebeest (in all native districts except Ndanga and Bikita), tsessabe (in all native districts except Sebungwe, Lomagundi, Wankie, Belingwe, Insiza, Chibi and Gwanda), ostrich.

Oribi are protected throughout the Colony, except in the native districts of Melsetter and Lomagundi, for a period of five years.

The following birds and animals are protected throughout the Colony:—

All species of storks (*Plataledæ, Ciconiidæ* and *Scopidæ*).
Nordmann's pratincole (*Glareola melanoptera*).
Small white heron and cattle egret (*Bubulcus ibis*).
Wattled starling (*Dilophus carunculatus*).
All species of plovers (*Charadriidæ*).
All species of cranes (*Gruidæ*).
All species of owls (*Strigidæ*).
The standard-winged nightjar (*Cosmetornis vexillarius*).
All species of bee eaters (*Meropidæ*).
All species of rollers (*Coraciidæ*).
The narina trogon (*Hapaloderma narina*).
All species of flamingoes (*Phœnicopteridæ*).
All species of ibis (*Ibidæ*).
All species of orioles (*Oriolidæ*).
All species of sunbirds (*Nectariniidæ*).
All species of bustard (*Pauuw* and *Koorhaan*).
All species of lovebirds (*Agapornis*).
Lemur (*Gelago crassicaudatus*).

The following are the fees for game licences:—

(a) Ordinary game licence	£1
(b) For a special game licence to a person domiciled in Southern Rhodesia	5
To a person not so domiciled	25
(c) For a royal game licence to a person domiciled in Southern Rhodesia	25
To a person not so domiciled	50
(d) For an owner's game licence	1
(e) For a sale licence	10

An owner's game licence entitles the holder to hunt any game animals (whether open season or close season and whether day or night) other than game protected by Proclamation. It does not entitle the holder to hunt any game birds except ostriches.

A sale licence entitles the holder to sell any dead game lawfully taken in the Colony during the open season.

With the exception of a royal game licence, licences are issued by Magistrates, Civil Commissioners and Native Commissioners.

The royal game licence is issued at the discretion of the Minister of Agriculture and Lands.

The shooting of game at night is prohibited, except where permission is granted by the Act.

The owner or occupier of cultivated land may shoot any wild animal or bird actually doing damage on such land.

Licences are not transferable and must be produced upon demand by any police officer.

The holder of a licence must not hunt game or trespass upon the land of another without permission of the owner or occupier.

Game may not be hunted in the Game Reserves of Wankie, Victoria Falls and Matopos National Park areas.

No live game, rhinoceros horns, elephant or hippopotamus tusks may be exported from the Colony without the written permission of the Minister of Agriculture and Lands. Exporters of live game must also obtain a certificate of health from the Chief Veterinary Surgeon, Salisbury.

The issue of permits for the capture or hunting of game for scientific or other purposes is at the discretion of the Minister of Agriculture and Lands, to whom application should be addressed by the scientific institute or zoological society requiring the specimens.

The hunting of game is permitted in certain specified tsetse fly areas without a licence.

Wildebeest may be hunted in the native districts of Bulalima-Mangwe, Gwanda, Chibi, Nyamandhlovu and Matobo without a licence.

An unlimited number of game of Class A may be hunted under an ordinary licence.

The holder of a special game licence may hunt three head of each of the species mentioned in Class B and no more, or should he elect to hunt more than three head of any one species in that class, then not more than fifteen head of game mentioned in Class B in all.

The number of head of royal game which may be hunted under a royal game licence is specified on each licence.

Heavy penalties are provided for contravention of the Act.

(Summarised from the "Game and Fish Preservation Act, 1929," and subsequent Proclamations.)

8th May, 1930.

A Tribute from Portuguese East Africa.

A subscriber at Mocimboa writes as follows:—

"With many thanks I received the copies of your Journal and the pamphlets you so very kindly sent me. Let me congratulate you upon your splendid work, full of interest and valuable information to the planter and farmer. I suppose only he can fully appreciate its excellence who has got to work in a country where there exists absolutely nothing of this kind. It is a pity to see that you have got to waste time and space in a fruitless battle against indifference and negligence on the part of those who ought to be most thankful for your invaluable efforts. Let them try and work in a part where nobody takes the slightest interest in their difficulties, where with endless sacrifices of time and money they have got to find out for themselves anything they want to know, and they will soon see things in a very different light."

Agricultural Costings at the Gwebi Farm.

GROUND NUTS AND MAIZE AND BEANS FOR SILAGE.

By H. G. Mundy, Dip.Agric.(Wye), F.L.S.,
Chief Agriculturist.

The following tables present the costs during the year 1929 of producing the ground nut crop and maize and bean crop for silage on this farm. The season was not a favourable one and the yield of both crops was appreciably below the average. This fact has materially increased the cost per bag of nuts and per ton of silage.

It will be noted that the cost of preparing the land for these two crops is shown at 5s. per acre as against 5s. 3d. per acre for the maize crop, particulars of which were published in the April issue of this Journal. The discrepancy is due to the fact that the total costs of preparing the arable lands for seeding in 1929, divided by the total acreage, amount to a sum of 5s. to 5s. 1d. per acre. The difference of 2d. per acre is due to some of the native labour employed on distributing fertiliser being allocated direct to the maize crop, whereas it should have been charged against preparation of lands in general, the total cost of which is then spread over all the arable land on an acreage basis. The maize crop therefore in this instance bore its fair share of the costs of preparation, and in addition carried this extra charge of 2d. an acre.

In the costs shown above for the ground nut crop no credit has been taken for the hay produced from the "tops," the yield of which over a number of years has averaged about a quarter of a ton per acre.

It is not proposed at this juncture to offer any further observations on these crop production costs. The publication of the first series of reports is made principally to enlighten the farming community on the methods of costing

which are being followed on the Gwebi farm and the objects which the Department had in view when adopting the system. The real value of the work will not be apparent for another three or four seasons, when averages can be struck of costs over a series of years. An immense amount of detailed information is being collected in respect to the results obtained under different systems of stock and land management and the costs of securing these results, but until such records extend over a number of years an analysis of the figures would be of no advantage.

For the present, therefore, costs must be dealt with in the aggregate. An instance in point is "preparation of land." The cost of these operations has been shown in the present reports in the total, but detailed information is being collected which will enable a complete analysis of the expenses to be made in order to show the individual costs of ploughing, harrowing, distributing fertiliser, spreading manure and so forth.

The publication of the reports so far issued has led to a certain amount of criticism from farmers, one point in particular being repeatedly stressed, namely, that a fair rate of interest on the capital invested in the farm ought to be included in the cost accounts. The decision to refrain from doing so was not taken without careful enquiry and consideration, and the final conclusion accepted was based upon the ruling of the School of Farm Economics, School of Agriculture, Cambridge University, which in 1927, as a result of a conference of agricultural economists, drew up a pamphlet of directions for the guidance of those engaged on agricultural cost accountancy work in Great Britain.

In this publication, the instructions in respect to interest on capital read as follows:—

> "*Interest on Capital and Management Charges.*—These two items should not be brought into the accounts (except where cash is actually paid), but they should be borne in mind when considering whether the profit actually realised is sufficient for the capital invested, the farmer's time as manager and the manual labour of the farmer and his family."

A number of farmers who have carefully studied the reports already published appear under the impression that the Department of Agriculture in making public the results of Gwebi costings is endeavouring to show the average cost of crop production over the Colony as a whole and also whether farming is a profitable business or not. This is far from being the true position. What is being attempted is to show the costs and returns of the farming operations followed on this particular farm with a view to ascertaining whether the systems adopted are satisfactory or otherwise, and also the directions in which economies or modification of methods are called for.

TABLE V.

Cost of Growing Ground Nuts.

Total area, 21.1 acres; total yield, 201.5 bags; yield per acre, 9.55 bags.

Statement A.—Showing the cost of operations, materials used and depreciation, etc., on implements.

	Average cost per acre.			Average cost per bag of ground nuts.		Per-centage.
	£	s.	d.	s.	d.	
Preparation of land	0	5	0	0	6	6.03
Fertiliser	0	12	0	1	4	14.47
Seed: selected and hand shelled	0	10	6	1	1	12.66
Planting (machine) in split rows	0	1	3	0	2	1.51
Cultivating (machine and hand)	0	5	11	0	7	7.14
Lifting and cocking	0	9	0	0	11	10.85
Picking, bagging, etc.	0	6	9	0	8	8.14
Bags (second-hand)	0	7	3	0	9	8.74
Sundries	0	4	2	0	5	5.03
Proportion of salaries of manager and assistant	0	9	7	1	0	11.56
Proportion of maintenance and depreciation on implements	0	11	6	1	3	13.87
Total	4	2	11	8	8	100.00

Statement B.—Showing the cost of labour, materials used and depreciation, etc., on implements.

		Average cost per acre. £ s. d.	Average cost per bag of ground nuts. s. d.	Percentage.
Native labour and food		1 13 2	3 5	40.00
Ox labour		0 0 9	0 1	0.91
Proportion of salaries of manager and assistant as in Statement A	s. d. 9 7			
Add amount charged to preparation of lands	0 2			
	——	0 9 9	1 1	11.76
Fertiliser		0 12 0	1 4	14.47
Seed		0 3 4	0 4	4.02
Bags (second-hand)		0 7 3	0 9	8.74
Sundries as in Statement A	4 2			
Less charged to native labour and food	0 7			
	——	0 3 7	0 4	4.32
Proportion of maintenance and depreciation on implements as in Statement A	11 6			
Add amount allocated to preparation of lands	1 7			
	——	0 13 1	1 4	15.78
Total		4 2 11	8 8	100.00

TABLE VI.

Cost of Growing Maize and Dolichos Beans for Silage.

Total area, 33.1 acres; total yield, 172 tons; average yield per acre, 5.196 tons.

Statement A.—Showing the cost of operations, materials used and depreciation, etc., on implements.

	Average cost per acre. £ s. d.	Average cost per ton. s. d.	Percentage.
Preparation of lands	0 5 0	1 0	8.03
Seed	0 3 9	0 8	6.08
Planting (two planters)	0 0 11	0 2	1.51
Cutting and carting to pits and chaffing	1 19 2	7 6	62.11
Sundries	0 1 1	0 3	1.79
Maintenance and depreciation on implements	0 8 2	1 7	13.08
Proportion of salaries of manager and assistant	0 4 7	0 11	7.40
Total	3 2 8	12 1	100.00

Statement B.—Showing the cost of labour, materials used and depreciation, etc., on implements.

		Average cost per acre.	Average cost per ton.	Percentage.
		£ s. d.	s. d.	
Native labour and food		0 19 2	3 8	30.53
Ox labour		0 1 0	0 2	1.53
Proportion of salaries of manager and assistant as in Statement A	s. d. 4 7			
Add amount charged to preparation of lands, etc.	2 2			
	——	0 6 9	1 4	10.75
Seed		0 3 9	0 8	6.08
Paraffin, etc., for cutting silage		0 4 9	1 0	7.49
Sundries		0 1 1	0 3	1.79
Maintenance and depreciation on implements as in Statement A ...	8 2			
Add amount charged to preparation of lands, etc.	18 0			
	——	1 6 2	5 0	41.83
Total		3 2 8	12 1	100.00

Note.—The staff of the Gwebi farm is responsible for the records and allocations on which this report is based, and the office of the Accountant to the Agricultural and Veterinary Departments for the compilation of the tables.

Future Outlook for the Cotton-Growing Industry in Southern Rhodesia.

The following is extracted from the annual report for 1929 of the Cotton Specialist, Empire Cotton Growing Corporation.

While it would be injudicious for the writer, or anyone else, to make an attempt at prophesying what the future of cotton will be in Southern Rhodesia, it may not be out of place to consider its possibilities as a crop.

In 1924-25, over 60,000 acres of cotton were planted, but subsequent experience has shown that so large an acreage was not justified. In the same year 239,032 acres of maize were planted. The proportion of cotton to maize was, therefore, about 1 to 4.

This figure is quoted merely to show what the farmers were able to plant at that time. The area they would be prepared to plant now, providing they find cotton growing a payable proposition, and using the above ratio, should therefore be in the vicinity of 75,000 acres.

The fact that sufficient seed has been purchased to plant 10,000 acres, although more was available, goes to show that farmers are now entering upon cotton growing with commendable caution. This is all to the good, and those interested in the furtherance of the crop would not have it otherwise. Should the 10,000 acres now planted give a payable return, we may confidently expect a larger increase in the acreage next year, though it may take another two years before the acreage planted in 1925 will be reached. Again, this is all to the good, as it will take about two more years to get further improved seed into general use. When this takes place it is felt that cotton will become a much more reliable crop than it has been in the past, irrespective of climatic conditions. Much will depend on the attitude

of the maize growers. At present they only look upon cotton as a rotation crop for maize. Should they find that it consistently pays them as well, or better, than maize, there is the possibility of their increasing the ratio of cotton to maize from 1 : 4 to 1 : 3 or even 1 : 1. While it is better not to anticipate so rapid an increase in cotton growing, it is as well to realise that such may happen.

The writer has been informed repeatedly that there is a tendency on some of the older farms towards a decrease in the acre yields of maize, and this seems to be corroborated, if one takes into consideration the history of maize growing in the Mazoe Valley, over the last two years. The fear of witchweed, which overshadows the maize growing industry, may become a potent factor in stimulating the growing of cotton. On the other hand, the depredations of the various bollworms have to be considered. Until last year their effect on the cotton crop appeared to be almost negligible, although it is not safe to make definite statements in this connection, as the majority of cotton crops did not carry a sufficient number of bolls to permit estimates of bollworm attack being made.

That several cotton crops were severely attacked last season may have been due to the lateness of the crop in general. Only very meagre information exists as to the incidence of bollworms from year to year, and some considerable time will have to elapse before much can be learned in this connection.

A point which has not been taken into consideration in the foregoing is the possibility of the extension of cotton growing into districts of which as yet little is known. There are a number of areas in Southern Rhodesia in which cotton growing may yet develop into a considerable industry. Attention in the past has been devoted mostly to the Hartley, Lomagundi and Mazoe districts, not so much on account of their suitability as to the fact that the farmers in these districts have evinced a keener interest in the crop. Whether the industry will take root and flourish in districts yet untapped remains to be seen. There are still many obstacles to overcome, but these, to the writer at least, do not appear to be unsurmountable, and there is every reason to look forward to the future with confidence.

A List of Plant Diseases Occurring in Southern Rhodesia.

(*Concluded.*)

Compiled by J. C. F. Hopkins, B.Sc. (Lond.), A.I.C.T.A., Plant Pathologist.

PEACH (*Prunus persica* L.).
Crown Gall *Bacterium tumefaciens* E. F. Sm. and Towns.
Scab (Freckle) *Cladosporium carpophilum* Thüm.
Leaf Curl *Taphrina deformans* (Fckl.) Tul.
Rust *Puccinia pruni-spinosæ* Pers.
Shot Hole *Bacterium pruni* E. F. Sm.
Shot Hole. Spray Injury.

PEAR (*Pyrus communis* L.).
Bitter Rot *Glomerella cingulata* (Stonem.) S. & v. S.
Internal Breakdown. Physiological.
Pink Disease *Corticium salmonicolor* (Berk. & Br.)
Scab *Venturia pyrina* Aderh.

PENTSTEMON (Cultivated).
Root Rot *Sclerotium rolfsii* Sacc.
Wilt *Fusarium vasinfectum* Atk.

Physalis minima L.
Mosaic. Virus.
Smut *Entyloma physalidis* (Kalchbr. & Cke.) Wint.

PINE (*Pinus* spp.).
P. longifolia.
Damping-off *Rhizoctonia solani* Kühn.
Violet Root Rot *Helicobasidium purpureum* (Tul.) Pat.
[*Rhizoctonia crocorum* (Pers.) DC. only.]

P. insignis.
Damping-off *Rhizoctonia solani* Kühn.
Root Disease *Macrophomina phaseoli* (Maubl.) Ashby.
[= *Rhizoctonia bataticola* (Taub.) Butl. Group C of Haigh.]

Plectranthus sp.
Rust *Æcidium plectranthi* Barcl.

Plectronia abbreviata K. Schum.
Rust *Æcidium baumianum* P. Henn.

PLUM (*Prunus* spp.).
Anthracnose *Glomerella cingulata* (Stonem.) S. & v. S.
Crown Gall *Bacterium tumefaciens* E. F. Sm. & Towns.
Rust *Puccinia pruni-spinosæ* Pers.
Sooty Mould *Capnodium* sp.

POTATO (*Solanum tuberosum* L.).
Anthracnose *Colletotrichum atramentarium* (Berk. & Br.) Taub.
Black Scurf *Corticium solani* Bourd. & Galz.
Dry Rot *Fusarium oxysporum* Schl.
Early Blight *Alternaria solani* (Ell. & Mont.) Jones & Grout.
False Scab. Mechanical Injury.
Leaf Blight. Frost Injury.
Root Rot *Sclerotium rolfsii* Sacc.
Wet Rot *Bacterium solanacearum* E. F. Sm.
Crinkle
Leaf Drop-Streak
Mosaic
Leaf Roll
Streak
Aucuba Mosaic
} Viruses.

Pterocarpus sp.
Leaf Spot *Systremma pterocarpi* Doidge.

PUMPKIN (*Cucurbita pepo* L.).
Leaf Spot *Septoria cucurbitacearum* Sacc.
Mildew *Erysiphe cichoracearum* DC.
Mosaic. Virus.

Pycnostachys reticulata Benth.
Rust *Æcidium pycnostachydis* Kalchbr.

RHUBARB (*Rheum rhaponticum* L.).
Collar Rot *Fusarium oxysporum*.
Damping-off *Rhizoctonia solani* Kühn.
Leaf Spot *Phyllosticta straminella* Bres.
Soft Rot *Bacillus carotovorus* L. R. Jones.

Rhyncosia minima DC.
Root Parasite *Striga orobanchoides* Benth.

ROSE (*Rosa* spp.).
Black Spot *Diplocarpon rosæ* Wolf.
Canker *Physalospora cydoniæ* Arnaud.
Crown Gall *Bacterium tumefaciens* E. F. Sm. & Towns.
Mildew *Sphærotheca pannosa* (Wallr.) Lév. [*Oidium* only.]
Mould *Cephalothecium roseum* Corda.
Stem Canker *Coniothyrium fuckelii* Sacc.

Royena sp.
Rust *Æcidium royenæ* Kalchbr. & Cke.

RYE (*Secale cereale* L.).
Mould *Cladosporium herbarum* (Link.) Fr.
Black Rust *Puccinia graminis* Pers.

Sida sp.
Rust *Puccinia heterospora* Berk. & Curt.

SNAPDRAGON (*Antirrhinum* spp.).
Collar Rot ? *Phytophthora* sp.
Root Rot *Sclerotium rolfsii* Sacc.
Wilt *Fusarium vasinfectum* Atk.

SPINELESS CACTUS (*Opuntia* sp.)
Scab *Bacterium* sp.

STRAMONIUM (*Datura stramonium* L.).
Leaf Spot *Alternaria crassa* (Sacc.) Rands.
Mosaic. Virus.

STRAWBERRY (*Fragaria* spp.).
Leaf Spot *Mycosphærella fragariæ* (Tul.) Lindau.
Root Rot *Sclerotium rolfsii* Sacc.

SUNFLOWER (*Helianthus annus* L.).
Leaf Spot *Septoria helianthi* Esk.

SUNN HEMP (*Crotalaria juncea* L.).
Anthracnose *Colletotrichum ? lindemuthianum* (Sacc. & Magn.) Bri. & Cav.
Mould *Cladosporium herbarum* (Link.) Fr.
Wilt *Fusarium vasinfectum* Atk.

SWEET PEA (*Lathyrus odoratus* L.).
Mildew *Oidium* sp.
[= ? *Erysiphe polygoni* DC.]
Wilt *Fusarium* (? *oxysporum* Schl.).

TEA (*Thea sinensis* L.).
Brown Blight *Colletotrichum camelliæ* Mass.
Grey Blight *Pestalozzia theæ* Saw.
Root Rot *Botryodiplodia theobromæ* Pat.

TOBACCO (*Nicotiana tabacum* L.).
Parasitic Diseases.
Angular Spot *Bacterium angulatum* Fromme.
Damping-off *Rhizoctonia solani* Kühn.
Frog Eye *Cercospora nicotianæ* Ell. & Ev.
Granville Wilt *Bacterium solanacearum* E. F. Sm.
Hollow Stalk *Bacillus carotovorus* L. R. Jones.
Leaf Blotch *Phyllosticta tabaci* Passer.
Leaf Spot *Alternaria longipes* (Ell. & Ev.) Mason.
Leaf Spot *Epicoccum* sp.
Mildew *Erysiphe cichoracearum* DC.
Pink Mould (in seed beds) *Pyronema omphalodes* (Bull.) Fckl.
Root Parasite *Striga orobanchoides* Benth.
Root Rot *Sclerotium rolfsii* Sacc.
Seedling Wilt *Fusarium* sp.
Shot Hole *Phyllosticta nicotiana* Ell. & Ev.
Wildfire *Bacterium tabacum* W. & F.
Wilt *Verticillum* sp.
Virus Diseases.
Mild Mosaic.
Ordinary Mosaic.
Yellow Mosaic.
Ring Spot (Western var. only).
Spot Necrosis (including "scorch" and white spot).
Climatic Diseases.
Drought Spot (death of tissue between veins).

Weather Spot (occurs when lower surface of leaf is exposed to sun and rain. Probably local burning).

Sand Burn. Minute spots on lower leaves.

Tearing and Bruising. Wind and hail damage.

Physiological Diseases.

Blackfire. Associated with slow growth and relative excess of nitrogen in soil.

"Firing." Waterlogged roots.

"Frenching." Nitrate deficiency.

Red Rust. Follows low "topping," especially during drought.

Sand Drown. Magnesium deficiency (rare).

Scorch. Sunburn following excess nitrogen in soil (especially in seed beds).

Seedling Blight. Excess potash in soil and *Alternaria tenuis* Nees.

Shot Hole. Copper dust injury.

Curing Diseases.

Black Leaf Spot *Cercospora nicotianæ* Ell. & Ev.

Leaf Rot (Fire cured) *Rhizopus stolonifer* Ehrenb.

Pole Sweat. Excess moisture and various fungi.

"Sponging." Unsuitable temperature and moisture relations (especially during cold weather at end of season).

Undetermined Diseases.

Crinkle. Associated with defective root system.

Leaf Splitting. Probably initiated by mechanical injury.

TOMATO (*Solanum lycopersicum* L.).

Blossom-end Rot. Unsuitable water relations and various fungi.

Curly Wilt. Virus.

Early Blight *Alternaria solani* (Ell. & Mont.) Jones & Grout.

Leaf Mould *Cladosporium fulvum* Cke.

Leaf Spot *Septoria lycopersici* Speg.

Mosaic. Virus.

Mouldy Fruit Rot *Rhizopus stolonifer* Ehrenb.

Wilt *Bacterium solanacearum* E. F. Sm.

Fusarium Wilt *Fusarium lycopersici* Sacc.

Vangueria sp.
- Rust *Æcidium vangueriæ* Cke.
- Rust *Hemileia woodii* Kalchbr. & Cke.

Vigna (See COWPEA).

VIOLET (*Viola odorata* L.).
- Leaf Spot *Cercospora violæ* Sacc.
- Leaf Spot *Phyllosticta violæ* Desm.

WALNUT (*Juglans* sp.).
- Trunk Rot *Schizophyllum commune* Fries.

WATERMELON (*Citrullus vulgaris* Schrad.).
- Mildew *Erysiphe cichoracearum* DC.

WHEAT (*Triticum vulgare* L.).
- Black Mould *Cladosporium herbarum* (Link.) Fr.
- Loose Smut *Ustilago tritici* (Pers.) Jens.
- Rust, Black *Puccinia graminis* Pers.
- Rust, Brown *Puccinia triticina* Erikss.
- Seedling Blight *Helminthosporium sativum* Pammel, King & Bakke.
- Stinking Smut or Bunt *Tilletia fœtens* (Berk. & Curt.) Trel.

Withania sp.
- Rust *Æcidium withaniæ* Thüm.

Zinnia (cultivated).
- Mildew *Oidium* sp.

Zizyphus jujuba.
- Mould *Hyalodema evansii* Magn.

Seeds for Sale, Gwebi Farm.

		s.	d.
Boer Manna	per lb.	0	4
Napier Fodder Roots	per bag	6	0
Edible Canna	per 100 "tubers"	9	0

All prices quoted are for *delivery free at any station or siding* in Southern Rhodesia. Before sending cheques, intending purchasers are advised to ascertain that the seeds, etc., required are still available. Cheques should be made payable to "Gwebi Farm." All orders and enquiries should be addressed to the Chief Agriculturist, Department of Agriculture, Salisbury, not direct to the Gwebi F...

Southern Rhodesia Weather Bureau.

APRIL, 1930.

Pressure.—The mean barometric pressure for the month was uniformly low, being lowest at Victoria with 0.039 in. below normal and highest at Umtali with 0.020 in. below normal.

Equatorial lows were very active in the early part of the month and were associated with excessive rain in the southern portion of the Colony.

Temperature.—The mean temperature of the month was about normal. The mean maximum temperatures varied from 4.8° F. below normal at Hartley to normal at Shamva. The mean minimum temperatures were above normal, varying from 4.9° F. above normal at Riverdene North to normal at Wankie. The mean relative humidity was generally above normal.

Rainfall.—Unusually heavy rains were recorded during the month. The highest rainfall returned was at Mtao, where 9.79 ins. fell. A large number of stations in Zones A and B recorded very heavy rain. The rainfall for the month amounts to 2.80 ins. The highest ever recorded was in April, 1925, when 2.88 ins. were recorded. An average of over 2 ins. for April has only been recorded on three previous occasions in 30 years.

The seasonal total is approximately 2.3 ins. below normal.

RAINFALL.

Station.	1930. March.	1930. April.	Total to end of period.	Normal rainfall to end of period.
Zone A.:				
Bubi—				
Bembesi Railway ...	1.18	4.66	23.41	23.40
Glenarton ...	1.93	...	...	25.32
Inyati ...	2.85	1.39	22.74	24.16
Judsonia ...	1.78	1.82	16.99	n.s.
Martha Farm ...	1.67	...	...	19.64
Nduba Farm ...	0.68	...	...	n.s.
Shangani Estate ...	1.18	2.29	21.76	24.81
Bulalima-Mangwe—				
Centenary ...	7.36	7.22	33.37	23.00
Kalaka ...	3 32	7.17	30.86	23.10
Riverbank ...	2.02	4.58	22.99	24.77
Solusi Mission ...	1.78	5.64	23.11	23.57
Bulawayo—				
Fairview Farm ...	2.73	7.10	30.67	21.92
Keendale ...	1.56	4.51	25.77	22.03
Crowhurst ...	1.36	...	...	23.51
Observatory ...	1.44	3.62	20.14	23.38
Waterworks ...	2.92	5.70	23.02	23.66
Gwelo—				
Brockenhurst ...	3.65	...	...	n.s.
Frogmore ...	2.07	...	...	n.s.
Gwelo Gaol ...	1.63	3.31	21.29	25.76
Riversdale Estate ..	...	...	...	29.11
Somerset Estate ...	1.91	2.72	17.66	25.13
Insiza—				
Orangedale ...	1.68	3.10	21.32	27.49
Shangani ...	1.47	0.93	17.13	23.69
Thornville ...	2.81	3.49	17.72	24.30
Nyamandhlovu—				
Gwaai Reserve ...	3.04	4.95	25.93	24.94
Gwaai Siding ...	3.47	5.49	26.73	n.s.
Naseby ...	3.93	3.28	21.41	23.02
Nyamandhlovu Railway ...	1.05	4.13	17.35	22.70
Sebungwe—				
Gokwe ...	6.12	2.18	31.52	30.24
Umzingwane—				
Springs ...	1.58	5.06	21.66	24.36
Wankie—				
Dett ...	0.11	...	...	22.35
Matetsi Railway ...	3.45	5 65	24.35	27.83
Ngamo Railway ...	1.05	4.10	23.72	26.31
Rosslyn ...	6.02	4.25	30.37	n.s.
Sukumi ...	2.14	3.74	25.73	28.04
Tom's Farm ...	2.79	4.30	22 77	n.s.
Victoria Falls ...	2.40	4.62	31.52	n.s.
Victoria Falls Railway ...	3.01	4 54	31.83	27.60
Wankie Hospital ...	1.85	2.98	20.34	23.17

RAINFALL—(Continued).

Station.	1930. March.	1930. April.	Total to end of period.	Normal rainfall to end of period.
ZONE B.:				
Belingwe—				
Bickwell ...	4.28	2.33	23.74	22.58
Sovelele ...	1.70	2.35	13.72	21.19
Tamba ...	1.08	3.02	17.18	18.87
Wedza ..	1.66	3.00	15.86	23.97
Bulalima-Mangwe—				
Bruwapeg ...	1.44	2.61	20.06	21.58
Empandeni ...	2.69	5.32	21.49	21.64
Fallowfields ...	2.18	4.24	19.54	n.s.
Garth ...	0.75	6.82	19.59	25.71
Maholi ...	...	...	...	27.87
Retreat ...	2.94	5.66	23.98	21.34
Sandown ...	4.53	6.11	23 53	26.64
Semokwe Reserve ...	3.23	3.52	20.63	n.s.
Tjankwa ...	1.69	...	...	27.59
Tjompani ...	1.84	5.20	26.02	24.67
Chibi—				
Bubye ...	2.39	5.44	15.60	14.85
Mtendelende ...	1.45	3.77	17.05	21.01
Nuanetsi Homestead ...	3.50	2.82	20.22	16.37
Nuanetsi N.C. ...	3.47	1.75	20.28	n.s.
Gwanda—				
Gwanda Gaol ...	1.71	4.02	17.55	20.66
Limpopo ...	0.94	1.14	8.61	11.50
Mazunga ...	0.62	2.79	14.14	16.38
Mtetengwe ...	2.60	1.25	11.63	12.53
Tuli ...	1.17	1.94	17.27	14.02
Insiza—				
Albany ...	2.98	2.48	20.25	24.01
Filabusi ...	2.29	...	...	21.68
Fort Rixon ...	2.94	...	...	22.36
Inyezi ...	1.26	3.03	21 24	23.10
Lancaster ...	1.40	5.52	21.81	25.58
Scaleby ...	2.24	3.03	20.85	n.s.
Wanezi Mission ...	1.94	3.36	22.07	n.s.
Matobo—				
Bon Accord ...	0.93	5.52	17.53	n.s.
Fort Usher ...	1.98	3.29	19 66	n.s.
Holly's Hope ...	1.41	5.15	18.78	21.40
Longsdale ...	4.07	6.94	27.45	n.s.
Matopo Mission ...	1.80	6.17	24.70	25.75
Mtshabezi Mission ...	2.02	4.85	19.04	21.85
Rhodes Matopo Park ...	3.34	4.11	22.55	28.53
Umzingwane—				
Balla Balla ...	2.37	...	...	24.33
Essexvale ...	0.79	4.12	21.43	24.52
Hope Fountain ...	3.34	...	...	26.63

RAINFALL—(*Continued*).

STATION.	1930. March.	1930. April.	Total to end of period.	Normal rainfall to end of period.
ZONE C. :				
Charter—				
Bushy Park ...	2.89	...	...	30.75
Enkeldoorn ...	6.72	1.76	28.27	28.97
Marshbrook ...	2.80	...	...	29.87
The Range ...	8.30	1.67	31.17	30.82
Vrede ...	4.16	3.77	31.91	31.53
Chilimanzi—				
Beacon Hill ...	3.33	4.79	25.31	32.39
Central Estates ...	2.80	4.07	24.33	32.62
Fourie's Post ...	4.78	2.20	18.88	27.62
Orton's Drift ...	3.75	2.85	25.26	26.62
Sebakwe Post ...	2.24	2.90	23.06	24.46
Umvuma Railway ...	2.66	4.45	23.94	28.17
Gwelo—				
Cross Roads ...	3.37	7.18	24.48	29.72
Delano Estate ...	2.41	2.28	20.03	n.s.
East Clare Ranch ...	3.21	4.95	26.55	33.24
Forestvale ...	4.57	4.82	27.97	n.s.
Globe and Phœnix Mine ...	3.35	3.20	25.92	28.42
Lannes Farm ...	2.21	3.00	21.59	n.s.
Lalapanzi ...	3.87	4.82	26.42	33.50
Lyndene ...	2.51	...	...	27.84
Woodendhove ...	1.86	4.17	22.51	30.16
Wold Farm ...	2.32	4.00	23.53	n.s.
Hartley—				
Ardgowan ...	4.11	...	...	31.51
Balwearie ...	...	...	...	31.51
Battlefields ...	5.28	2.59	34.32	29.11
Beatrice ...	2.88	2.06	22.13	33.52
Carnock ...	5.60	1.34	33.00	31.75
Cromdale ...	3.50	2.42	28.29	33.00
Currandooley ...	2.89	3.91	29.78	n.s.
Eiffel Blue Mine ...	2.88	2.39	29.57	27.43
Elvington ...	3.83	1.15	25.83	30.48
Gatooma ...	3.59	3.13	29.72	31.91
Cotton Breeding Station ...	3.15	2.76	29.23	n.s.
Gowerlands ...	4.51	0.74	27.68	30.88
Handley Cross ...	6.71	3.09	30.17	n.s.
Hartley Gaol ...	4.13	1.98	28.62	32.22
Hopewell ...	5.78	...	...	32.32
Jenkinstown ...	5.33	3.42	32.73	32.95
Maida Vale ...	5.66	3.27	28.99	28.94
Meadowlands ...	2.85	2.38	31.13	n.s.
Nyadgori ...	3.86	1.42	28.04	30.11
Pulham ...	2.05	2.58	28.79	33.19
Ranwick ...	2.39	1.56	30.44	33.42
Sunny Bank ...	3.39	3.61	28.38	n.s.
Thorndyke ...	6.78	2.61	28.90	27.16

RAINFALL—(*Continued*).

STATION.	1930. March.	1930. April.	Total to end of period.	Normal rainfall to end of period.
ZONE C.—(Continued)				
Lomagundi—				
Argyle ...	3.08	...	...	31.82
Baguta ...	5.23	2.21	29.39	34.17
Between Rivers ...	5.01	..	...	n.s.
Citrus Estate ...	4.46	2.07	28.35	32.21
Strathdon ...	4.40	1.46	27.10	n.s.
Darwendale ...	3.57	1.93	22.79	30.94
Dedsi ...	2.56	...	...	31.36
Dingley Dell ...	2.17	...	...	31.30
Gambuli ...	4.06	2.72	24.47	34.58
Kapiri ...	1.65	3.84	25.14	34.21
Kashao ...	4.79	2.56	27.77	n.s.
Kenidia ...	3.81	1.48	21.06	n.s.
Mafoota ...	5.04	1.38	26.87	30.22
Maningwa ...	4.37	...	...	32.47
Miami ...	3.74	1.83	22.17	n.s.
Mica Field ...	6.14	2.16	21.54	30.28
Montrose ...	1.70	3.29	29.58	33.08
Mpandegutu ...	5.52	...	...	32.95
Msina ...	...	...	...	n.s.
Mukwe River Ranch ...	2.95	3.17	27.05	30.89
Nyapi ...	4.15	0.53	23.06	31.99
Wari ...	3.25	1.46	23.09	29.99
Nyati ...	3.45	...	...	25.74
Palm Tree Farm ...	3.14	...	...	31.53
Pendennis ...	4.39	0.37	21.88	n.s.
Raffingora ...	...	...	...	29.93
Renardia ...	5.10	2.64	29.79	33.40
Richmond ...	2.77	1.18	22.06	27.52
Robbsdale ...	4.28	3.48	27.29	n.s.
Romsey ...	...	...	...	32.50
Silater Estate ...	3.49	0.56	21.90	34.32
Sinoia ...	7.20	1.88	29.65	30.99
Sipolilo ...	4.37	1.78	26.84	32.60
Umvukwe Ranch ...	1.99	1.71	24.62	32.79
Woodleigh ...	4.50	0.44	29.80	34 87
Yeanling ...	2.49	2 75	25.97	32.03
Zebra Vlei ...	2.70	3.42	25.17	30.51
Marandellas—				
Rocky Spruit ...	4.50	...	...	42.03
Mazoe—				
Pembi Ranch ..	3.55	3.25	29.97	n.s.
Salisbury—				
Agricultural Experiment Station	3.75	0.37	24.33	29.51
Avondale (Broadlands) ...	3.72	...	...	31.84
Ballineety ...	4.89	1.66	23.11	32.40
Bromley ...	2.55	3.78	34.05	33.50
Cleveland Dam ...	3.26	0.50	27.18	31.76
Forest Nursery ...	1.86	0.70	21.57	32.49
Gwebi ...	5.08	1.25	24.92	32.54

RAINFALL—(*Continued*).

STATION.	1930. March.	1930. April.	Total to end of period.	Normal rainfall to end of period.
ZONE C.—(Continued)				
Salisbury (continued)—				
Salisbury Agricultural Dept.	3.75	0.23	21.80	31.33
Sebastopol ...	3.57	1.08	25.66	33.31
Stapleford ...	4.37	...	...	33.93
Tobacco Experiment Station	3.52	0.33	22.10	34.34
Western Commonage ...	4.17	0.22	25.65	29.43
Sebungwe—				
Sikombela ...	4.32	...	...	32.23
Wolverley ...	3.38	...	...	28.26
ZONE D. :				
Darwin—				
Cullinan's Ranch ...	3.66	3.26	28.86	28.36
Mount Darwin ...	4.95	2.72	25.10	29.89
Rusambo ...	5.24	0.37	25.57	n.s.
Inyanga—				
Inyanga ...	6.33	1.75	28.00	37.07
Juliasdale ...	10.40	3.24	42.76	44.29
Rhodes Estate ...	9.55	1.06	33.91	42.72
Makoni—				
Ardlamont ...	...	...	...	n.s.
Eagle's Nest ...	4.52	1.34	31.03	33.10
Mayo Ranch ...	2.92	...	...	n.s.
Wensleydale ...	...	...	...	33.72
Mazoe—				
Argyle Park ...	5.04	1.26	27.07	31.80
Atherstone ...	4.19	...	...	34.38
Bellevue ...	5.48	2.14	27.92	33.09
Bindura ...	4.14	1.95	24.00	33.36
Ceres ...	3.65	2.30	29.38	37.41
Chipoli ...	8.23	0.58	35.30	33.01
Citrus Estate ...	2.51	3.41	27.64	34.46
Craigengower ...	4.08	...	...	33.39
Dandejena ...	5.93	...	..	n.s.
Donje ...	6.39	3.70	33.50	n.s.
Frogmore ...	3.23	...	...	33.95
Glen Divis ...	2.37	2.07	27.17	39.12
Glen Grey ...	4.31	3.08	25.15	29.32
Great B ...	6.55	0.94	32.79	33.79
Hinten ...	4.74	...	...	25.13
Horta ...	4.30	0.74	27.16	33.90
Kilmer ...	4.10	...	...	33 16
Kingston ...	4.80	2.37	32.04	37.77
Maienza ...	...	...	...	36.03
Marston Farm ...	3.67	2.02	25.41	n.s.
Mazoe Dam ...	2.38	0.84	24.37	35.18
Mgutu ...	3.03	1.10	23.92	39.11
Muripfumba ...	4.71	2.97	34.80	30.65
Omeath ...	3.10	3.20	30.86	32.92

RAINFALL—(*Continued*).

Station.	1930. March.	1930. April.	Total to end of period.	Normal rainfall to end of period.
Zone D.—(Continued)				
Mazoe (continued)—				
Pearson Settlement ...	2.55	...	...	35.61
Riversdale Estate ...	5.64	1.40	24.24	30.35
Ruia ...	5.12	...	...	36.23
Rustington ...	4.10	...	...	31.19
Shamva Mine ...	5.08	1.15	30.72	33.34
Stanley Kop ...	6.35	1.24	30.52	31.40
Sunnyside ...	5.19	...	...	34.25
Teign ...	3.99	2.09	24.23	33.90
Usk ...	3.84	1.63	32.96	39.62
Virginia ...	3.20	3.50	27.71	32.35
Visa ...	4.37	...	...	n.s.
Woodlands ...	...	...	...	37.08
Zombi Farm ...	3.84	1.34	29.48	37.85
Mrewa—				
Maryland ...	8.12	0.87	30.11	n.s.
Montclair ...	5.64	0.42	27.66	n.s.
Mrewa ...	4.14	1.58	28.12	34.74
Nyaderi Mission ...	5.44	1.83	26.62	29.13
Selous Nek ...	4.83	1.82	28.60	33.07
Mtoko—				
Makaha ...	10.18	0.74	28.49	34.08
Mtoko (N.C.) ...	4.22	0.58	34.99	28.15
Salisbury—				
Arcturus ...	3.31	1.49	26.55	39.95
Chindamora Reserve ...	0.72	0.47	19.16	36.41
Glenara ...	3.30	1.58	23.59	32.97
Goromonzi ...	4.27	1.71	27.84	36.76
Hatcliffe ...	3.90	...	...	35.21
Hillside (Bromley) ...	4.11	2.53	32.88	38.50
Kilmuir ...	2.40	...	...	41.38
Meadows ...	4.85	1.16	30.94	39.93
Pendennis ...	2.68	...	...	n.s.
Selby ...	3.73	0.80	25.64	31.59
Springs ...	4.68	1.51	26.71	34.19
Teviotdale ...	4.69	1.56	23.95	n.s.
Vainona ...	2.45	0.44	19.81	33.14
Zone E.:				
Belingwe—				
Belingwe (N.C.) ...	1.27	2.41	20.13	22.19
Doro ...	1.94	3.26	24.32	23.96
Shabani ...	4.14	0.69	16.06	25.61
Bikita—				
Angus Ranch ...	4.83	1.52	23.37	22.88
Bikita ...	11.60	2.19	40.55	37.43
Devuli Ranch ...	7.27	2.21	22.51	20.87
Pamushana ...	...	...	...	34.31

RAINFALL—*(Continued)*.

Station.	1930. March.	1930. April.	Total to end of period.	Normal rainfall to end of period.
Zone E.—(Continued)				
Charter—				
Buhera ...	9.71	4.45	29.87	34.13
Chibi—				
Chibi ...	2.38	...	...	23.34
Lundi ...	4.57	3.06	34.19	25.57
Mpapas ...	2.54	...	...	23.25
Chilimanzi—				
Allanberry ...	2.45	5.63	27.32	28.45
Driefontein ...	6.19	4.87	23.54	26.98
Felixburg ...	4.88	2.98	22.10	29.53
Grootfontein ...	..	...	...	27.91
Induna Farm ...	3.12	5.02	19.95	31.75
Mtao Forest ...	6.49	9.79	32.70	29.60
Makowries ...	3.80	6.20	26.97	n.s.
Thornhill ...	2.45	...	...	n.s.
Gutu—				
Alheit Mission ...	3.79	...	...	24.63
Devuli Store ...	3.30	2.40	21.82	n.s.
Eastdale Estates ...	3.65	4.98	28.85	33.69
Gutu (N.C.) ...	5.71	3.97	24 09	29.55
Glenary ...	5.33	3.99	24.86	26.19
Gwelo—				
Glencraig ...	3.56	4.89	28.16	32.80
Partridge Farm ...	4.39	5.83	30.64	35.75
Sheep Run Farm ...	3.16	4.84	22.08	29.55
Inyanga—				
St. Trias' Hill ...	10.26	1.56	40.77	38.82
Insiza—				
Roodeheuvel ...	1.03	3.96	23.27	27.26
Stoneham (Brae Valley) ...	2.32	3.87	23.45	n.s.
Makoni—				
Bude ...	...	...	..	n.s.
Craigendoran ...	3.98	2.17	26.50	33.97
Forest Hill ...	7.21	3.57	34.84	35.16
Kairidzi ...	4.22	2.20	31.32	n.s.
Mona ...	3.66	4.00	35.51	37.81
Monte Cassino ...	4.14	1.93	35.05	34.53
Ruati ...	7.79	...	...	n.s.
Rusape (N.C.) ...	4.14	4.04	34.45	n.s.
Springs ...	5.18	2.96	35.73	33.08
Whitgift ...	4.17	2.98	27.05	n.s.
Marandellas—				
Bonongwe ...	5.05	2.85	37.84	32.65
Delta ...	3.05	2.38	35.56	36.55
Elandslaagte ...	4.20	3.28	34.32	33.23
Lushington ...	4.10	2.49	31.93	n.s.
Macheke ...	6.43	1.47	32.38	33.95
Marandellas (N.C.) ...	6.42	2.58	39.73	35.80

RAINFALL—(*Continued*).

Station.	1930. March.	1930. April.	Total to end of period.	Normal rainfall to end of period.
ZONE E.—(Continued)				
Marandellas (Continued)—				
Marandellas Estate ...	4.02	...	...	30.17
Nelson ...	5.76	1.96	34.73	30.18
Wedza Reserve ...	6.29	4.17	38.31	n.s.
Wenimbi ...	7.73	...	...	33.74
Melsetter—				
Brackenbury ...	6.68	...	...	55.48
New Year's Gift ...	3.78	0.80	22.66	n.s.
Sabi Tanganda Estate ...	1.75	...	...	n.s.
Ndanga—				
Bangala Ranch ...	6.50	1.14	24.72	n.s.
Doornfontein ...	7.70	4.20	31.48	29.69
Marah Ranch ...	7.01	3.23	27.11	30.61
Triangle Ranch ...	2.53	1.81	20.89	23.46
Zaka ...	4.38	2.11	24.47	n.s.
Selukwe—				
Aberfoyle Ranch ...	3.17	2.81	24.36	30.94
Hillingdon ...	3.12	2.99	24.75	33.84
Impali Source ...	2.76	2.17	21.60	29.41
Rio ...	3.26	2.93	24.82	30.77
Safago ...	3.89	2.43	27.06	33.51
Selukwe ...	7.23	4.87	43.01	43.41
Umtali—				
Argyll ...	4.94	1.12	22.22	33.00
Embeza ...	10.66	3.38	49.35	n.s.
Fairview ...	7.62	2.99	28.29	33.79
Fern Valley ...	3.12	1.85	22.53	35.15
Jerain ...	3.72	1.87	24.00	31.62
Mountain Home ...	13.38	5.34	51.39	n.s.
Mutambara Mission ...	2.09	2.83	20.91	28.21
Odzani Power Station ...	11.70	1.71	36.09	37.03
Park Farm ...	6.50	3.01	30.32	45.05
Premier Estate ...	5.99	2.29	30.26	31.41
Sarum ...	7.21	...	...	30.99
Sheba ...	13.47	5.65	65.74	n.s.
Stapleford ...	9.18	4.32	51.35	67.07
St. Augustine's Mission ...	10.20	3.53	37.79	40.54
Transsau Estate ...	3.17	1.65	18.87	32.43
Umtali Gaol ...	7.65	2.69	31.10	30.58
Victoria—				
Bruceliame ...	3.42	2.11	22.15	27.56
Cambria ...	3.87	4.00	21.46	23.38
Cheveden ...	8.10	2.71	31.14	34.25
Clipsham ...	4.14	2.00	24.94	27.22
Gokomere ...	3.53	3.59	23.63	28.86
Kimberley Ranch ...	3.41	3.11	24.85	n.s.
Mashaba ...	4.81	3.74	26.54	30.11
Miltonia ...	2.23	2.66	19.88	n.s.
Riverdene North ...	5.46	2.03	23.27	26.04

RAINFALL—*(Continued).*

Station.	1930. March.	1930. April.	Total to end of period.	Normal rainfall to end of period.
Zone E.—(Continued)				
Victoria (Continued)—				
Salemore ...	7.04	4.42	26.03	34.48
Silver Oaks ...	3.48	2.92	23.25	28.35
Stanmore ...	3.95	...	...	24.88
Victoria ...	2.77	3.68	22.71	25.04
Zimbabwe ...	6.10	...	...	31.04
Zone F.:				
Melsetter—				
Chikore ...	8.14	1.90	33.09	43.03
Chipinga ...	8.84	1.03	31.71	42.86
Lettie Swan ...	9.39	1.47	29.74	43.53
Melsetter ...	10.58	3.48	37.70	44.13
Mount Selinda ...	11.91	2.72	44.52	58.46
Vermont ...	17.69	...	...	60.18
Umtali—				
Cloudlands ...	8.71	2.88	38.66	n.s.

Salisbury Experiment Station.

FOR SALE.

KUDZU VINE CROWNS.

A limited quantity of kudzu vine crowns are available for sale at the following rates:—

Large crowns ... ... 6d. each.
Small crowns ... ... 3d. each.

Prices are carriage free to any station or siding in Southern Rhodesia.

Purchasers are recommended not to plant small crowns, except on land which can be irrigated. Orders with remittances should be addressed to the Chief Agriculturist, Department of Agriculture, Salisbury.

Export of Cattle from Southern Rhodesia, 1930.

Month	Union		England.	Congo		N. Rhodesia.		Portuguese East Africa.		Total
	Slaughter		Slaughter							
	Johannesburg	I.C.S. for overseas	On hoof	Slaughter	Breeding	Slaughter	Breeding	Slaughter	Breeding	
January ...	...	...	...	2,449	67	...	...	...	...	2,516
February ...	...	...	..	3,438	8	537	91	...	11	4,085
March ...	25	...	150	1,097	...	249	...	...	7	1,538
April ...	53	863	...	2,636	115	120	...	...	...	3787
May ...										
June ...										
July ...										
August ...										
September ...										
October ...										
November ...										
December ...										
	...	...	...	...	...	...	...	...	...	...

Dates of Meetings of Farmers' Associations, Southern Rhodesia.

Name of Association.	Place of Meeting.	Secretary.	June.	July.
			1930	1930
Ayrshire—Sipolilo	Various farms	G. H. Cautherley	14	12
Banket Junction	Banket Hotel	A. M. Hutchinson	6	4
Beatrice District	Farmers' Hall, Beatrice	W. Krienke	26	31
Bindura	Bindura Farmers' Hall	W. E. Fricker	13	11
Bromley	Farmers' Hall, Bromley Siding	E. Taylor	4	2
Bubi	Queen's Mine	W. H. Perham	20	18
Bulawayo Landowners' and Farmers' Association	Library Buildings, Bulawayo	T. B. Hepburn	3	1
Chakari	Various farms	R. Codrington	19	17
Daisyfield	Daisyfield (June), Somabula (July)	L. E. Edwards	21	12
Darwendale—Trelawney	Various farms	Charles H. Tanner	25	23
Eastern Districts	Farmers' Hall, Chidza	W. E. Richards	14	12
Enkeldoorn	Enkeldoorn	C. N. Ludlowe	3	1
Enterprise	Farmers' Hall	W. Stobart	3	1
Essexvale	Essexvale	Col. D. Judson	15	20
Felixburg—Gutu	Ferndown (June), Felixburg Store (July)	E. C. Fleetwood	14	12
Figtree Branch, R.L. and F.A.	Figtree Hotel	The Secretary	3	1
Gadzema	Gadzema Hotel	H. G. M. Liddell	13	11
Gatooma	Speck's Hotel	Col. J. A. Smith	21	19
Gatooma (Golden Valley Branch)	Golden Valley Hotel	C. K. James	14	12
Gazaland (South Melsetter)	Farmers' Hall, Chipinga	J. Ward	21	19
Greystone	Quarrie Farm	P. J. van der Walt	...	12
Gwanda	Lowenthal's Building, Gwanda	N. J. B. Nilson	21	19
Hartley	Hartley Hotel	Mrs. F. C. Watson	14	12
Headlands	Headlands	J. A. Eve	...	...
Hunter's Road	Hunter's Road	R. W. Twilley	28	26
Insiza South	Farm Lancaster	J. Campbell	12	10
Inyazura	Inyazura	W. P. Frudd	6	...
Lalapansi	Lalapansi	B. J. Ingle	14	12
Lomagundi	Sinoia	F. W. Robertson	...	11
Lomagundi West	Various farms	A. A. Bisset	8	13
Macheke	Various farms	R. O. Jackson	...	...

Macheke Valley (Headlands) Farmers' and Tobacco Growers' Association	Various Farms	T. R. Colam	7	5
Makwiro	Makwiro	W. L. Parsons	20	18
Marandellas	Marandellas Farmers' Hall	E. Cruikshank	6	4
Marandellas, Southern	Various farms	B. V. Cherry	4	2
Mashonaland	Mashonaland Farmers' Hall, Salisbury	P. Wilson	13	11
Matobo South	Farmers' Hall, Malundi Farm	A. G. Allan	21	19
Matopo Branch, R.L. and F.A.	Farmers' Hall, Malundi	W. Mirtle	21	19
Mazoe (Concession)	Various farms	Douglas Southey	13	11
Mazoe (Glendale)	Farmers' Hall, Glendale	James S. Brown	11	9
Melsetter	Court House, Melsetter	J. C. Kruger	12	10
Ngezi-Umniati	Harvieston, Enkeldoorn	Miss Harvie	28	26
North Melsetter	Various farms	P. F. de Bruyn	14	...
North Umniati	———	J. F. Eagar	Not	received
Norton and Lydiate District	Norton	A. Jones	6	4
Nyamandhlovu	Nyamandhlovu	R. D. McLean	...	...
Odzi District Farmers	Odzi Hotel	M. Goldberg	7	5
Poorte Valley	Various places	A. D. Wilson	21	19
Que Que	Offices of the Que Que Sanitary Board	A. A. Ackerman	21	19
Rusape Farmers' Association	Rusape	E. C. Harrington	7	5
Salisbury South	Various farms	P. Linton	25	30
Shamva	Shamva Court House	L. H. S. Paxton	20	18
Shamva North	Various farms	Mrs. E. J. Stevenson	21	...
Two Rivers Farming Association	Various farms	W. L. Parsons	21	19
Umboe (Branch of Lomagundi F.A.)	Various farms	G. T. Gover	14	12
Umvukwe Farmers' and Tobacco Growers' Association	Various ranches	———	14	12
Umtali	Drill Hall, Umtali	A. Howat	5	3
Umvuma and District	Court House, Umvuma	S. T. Montgomery	20	18
Victoria	Victoria	G. E. Lamb	7	5
Wankie District	———	F. H. Going	Not	received
West Umvukwe Farmers' Association	Various farms	G. H. Gordon	7	5
Western	Plumtree Hotel	The Secretary	14	12
Willoughbys	Willoughbys	A. E. Roberts	Not	received

Rhodesian Milk Records.

Official Milk Records.

Name of cow.	Breed.	Milk in lbs. to date.	Butter fat in lbs. to date.	No. of days.	Name and address of owner.
Morgenzon Ermine	Friesland	5,037.60	163.13	262	W. R. Blackwell, Norton
Morgenzon Nonaber	do	4,526.30	171.64	250	do do
Morgenzon Kleinhans	do	4,907.50	163.94	256	do do
Morgenzon Symphony	do	4,396.60	160.49	150	do do
Morgenzon Kleingoed	do	3,875.70	137.97	150	do do
Morgenzon Astralia	do	2,482.80	83.50	90	do do
Dunoran Pearl	do	769.30	23.23	30	do do
Thibet Park Dainty	do	2,723.50	79.67	60	G. A. Lyons, Bulawayo
Thibet Park Zenobia	do	2,739 50	95.69	60	do do
Princess Park Primrose	do	7 297.00	241.74	240	do do
De Grendel Nancy	do	11,751.00	354.05	210	do do
Burnbrae Charm	Ayrshire	1,660.80	62.40	60	E. MacPherson, Figtree
Planchette of Tolosa	Friesland	5,686.80	180.36	210	F. B. Morrisby, Gwelo
Riverview Mary	do	5,018.40	169.43	180	do do
Erin-go-Bragh Xmas Gift	do	1,339.10	47.78	60	do do
Maldon Broadhooks	Shorthorn	2,993.50	113.99	210	Roberts & Letts, Heany
Maldon Dot	do	1,796.50	69.29	150	do do
Maldon Active Girl	do	1,874.50	69.89	90	do do
Maldon Aurora	do	2,169.50	74.01	120	do do
Maldon Camellia	do	1,418.50	61.35	90	do do
Maldon Emblem	do	892.50	31.05	60	do do
Maldon Dairymaid	do	498.50	19.74	30	do do
Whinburn Daphne	Friesland	5,899.00	180.87	240	R. R. Sharp, Redbank
Middleton's Zoe	do	7,489.50	233.50	240	do do
Whinburn Primrose	do	6,047.00	266.56	270	do do
Middleton's Pamphylia	do	6,867.50	228.10	270	do do
Whinburn Spottie	do	7,102.00	253.12	300	do do
Whinburn Annette	do	4,622.50	148.05	210	do do

RHODESIAN MILK RECORDS (continued).

Official Milk Records (continued).

Name of cow.	Breed.	Milk in lbs. to date.	Butter fat in lbs. to date.	No. of days.	Name and address of owner.	
Whinburn Zephyr	Friesland	3,772.00	117.50	180	R. R. Sharp, Redbank	
Whinburn Pansy	do	4,491.00	140.65	180	do	do
Eldorado Volsante	do	2,550.00	76.34	90	do	do
Venter's Rust Rika IV.	do	1,898.50	60.02	60	do	do
Eldorado Pourquoi	do	1,185.00	28.67	30	do	do
De Grendel Boukje	do	4,607.50	176.23	150	A. F. Valentine, Umtali	
Rathwick Pietje	do	1,828.50	53.03	60	do	do
Groenvlei Bedford Alberta	do	5,453.45	165.94	120	P. T. Webb, Iron Mine Hill	
Sheep Run Duchess	do	1,876.45	55.66	60	do	do
Albert Vale Zuineg	do	4,183.00	146.36	150	F. Zeender, Insiza	
Albert Vale Spinnekop	do	3,343.00	107.50	120	do	do
Tell Riggie	do	2,292.50	88.59	120	do	do
Albert Vale Nil B. III.	do	3,414.50	109.23	150	do	do
Thibet Park Myrtle	do	2,691.50	95.53	90	do	do
Thibet Park Olive	do	4,083.50	139.15	90	do	do
Albert Vale Kruppel	do	2,336.50	73.71	60	do	do
Wolseley Vera II.	do	2,468.00	78.07	60	do	do
Thibet Park Sylvia	do	1,121.00	37.88	30	do	do
De Grendel Selma	do	9,772.00	271.74	300	Govt. Farm, Gwebi	
Melrose Corrie	do	9,303.00	257.91	240	do	do
Madge of Batavia	do	5,759.50	185.12	210	do	do
Gwebi Beryl	do	3,488.00	118.04	210	do	do
De Grendel Bessie Burger	do	6,357.00	208.29	180	do	do
Gwebi Bunty	do	3,128.00	106.63	120	do	do
Melrose Roosje	do	3,261.00	88.79	90	do	do
Brightwell Rain	Red Poll	6,603.90	206.03	240	Govt. Farm, Matopos	
Drinkstone Missie	do	4,770.60	174.12	180	do	do
Threave Flowergirl	do	4,773.50	214.43	150	do	do

RHODESIAN MILK RECORDS (continued).

Semi-official Milk Records.

Name of cow.	Breed.	Milk in lbs. to date.	Butter fat in lbs. to date.	No. of days.	Name and address of owner.
Bluff Hill Flora	Friesland	2,087.00	46.63	90	E. Barnard, Salisbury
Primrose ...	Grade Friesland	4,400.50	163.78	228	W. R. Blackwell, Norton
Waterbloem ...	do	3,962.30	139 29	230	do do
Kleinbloem ...	do	5,035.40	169.50	219	do do
Mooibloem ...	do	3,962.00	147.97	210	do do
Glen Arum Buttercup	Shorthorn	2,648.60	101.73	150	C. G. Cooper, Essexvale
Lorna ...	Grade Shorthorn	2,637.00	119.30	161	do do
Glen Arum Susannah	Shorthorn	3,057.20	110.08	150	do do
Glen Arum Flora	do	1,337.60	38.53	120	do do
Bella ...	Grade Shorthorn	1,916.60	66.59	90	do do
Snowdrop ...	do	1,315.90	55.05	90	do do
Zazkins ...	do	2,229.10	99.27	90	do do
Zazola ...	do	1,327.20	73.55	60	do do
Pepper ...	do	669.40	27.44	30	do do
Lady Jane ...	do	334.00	12.89	30	do do
D. Alta ...	Friesland	3,208.00	91.79	120	Huckle Bros., Inyati
D. Tottie II. ...	do	2,523.00	88.36	120	do do
D. Moffie ...	do	1,857.00	61.56	120	do do
D. Violet ...	do	2,522.00	74.34	120	do do
Patricia ...	Grade Shorthorn	4,812.50	183.73	240	D. Jarvis, Gwelo
Jewel ...	do	1,339.75	34.32	120	do do
Sylvia ...	do	2,183.25	86.86	150	do do
Despatch Affinity	Shorthorn	1,748.75	72.71	150	do do
Prudence ...	Grade Shorthorn	1,753.25	64.20	120	do do
Despatch Antoinette	do	602.50	18.73	60	do do
Barbara I. ...	Grade Friesland	7,377.90	251.76	240	F. B. Morrisby, Gwelo
Freezia ...	do	9,078.90	308.91	300	do do
Youth ...	do	5,669.20	204.38	240	do do
Daffodil ...	do	5,237.00	161 03	210	do do
Beauty ...	do	1,590.30	45.47	60	do do
Zeilie ...	do	1,265.50	57.74	60	do do
Largesse ...	do	837.10	41.01	30	do do
Emily ...	do	747.60	29.45	30	do do
Patience ...	do	585.70	18.33	30	do do
Freckles ...	do	1,320.20	48.42	60	do do
Redbank No. 165	Grade Shorthorn	6,602.50	244.08	240	Roberts & Letts, Heany
Bochen Sheila	do	4,839.00	168.23	210	do do
Nyondu No. 50	do	3,323.00	135.87	180	do do
Moff No. 156 ...	do	2,212.00	80.08	120	do do
Serjeant No. 79	do	2,305.50	90.71	120	do do

RHODESIAN MILK RECORDS (continued).

Semi-official Milk Records (continued).

Name of cow.	Grade.	Milk in lbs. to date.	Butter fat in lbs. to date.	No. of days.	Name and address of owner.
Afric No. 122 ...	Grade Shorthorn	2,065.00	72.99	90	Roberts & Letts, Heany
Sugar No. 105	do	1,193.00	43.65	60	do do
Mscopie No. 159	do	1,923.00	76.98	60	do do
Moff No. 163 ...	do	1,165.00	38.38	60	do do
Redbank No. 33	do	1,229.00	46.09	60	do do
Busie No. 38 ...	do	1,833.00	67.90	60	do do
Shore No. 15 ...	do	758.50	30.18	30	do do
Whinburn Linnet	Grade Friesland	10,028.50	283.19	270	R. R. Sharp, Redbank
Whinburn Buttercup	do	8,617.50	285.98	270	do do
Whinburn Butterfly	do	6,263.50	197.91	270	do do
Whinburn Sidi	do	5,702.00	169.82	270	do do
Whinburn Blackbird	do	7,477.00	246.09	300	do do
Wren ...	do	4,731.50	146.38	180	do do
Whinburn Plush	do	3,695.50	104.09	150	do do
Bess	do	3,505.00	104.88	180	M. S. Smith, Gwelo
Martha ...	do	3,595.50	168.59	240	do do
Molly ...	do	4,817.00	182.14	210	do do
Thora ...	do	3,773.00	145 94	240	do do
Star	do	3,054.00	99.10	240	do do
Grace ...	do	4,243.00	164.28	210	do do
Flora	do	4,037.00	135.35	210	do do
Ugly	do	2,675.50	141.53	150	do do
Wendy ...	Grade Ayrshire	4,128.50	172.32	180	do do
Midget ...	Grade Kerry	3,906.00	152 87	180	do do
Doreen ...	Grade Friesland	3,240.00	105.50	180	do do
Biddy ...	do	2,792.00	96.44	120	do do
Dot	do	1,560.00	59.51	90	do do
Spring Grove Seale	S. Devon	870.00	32.68	60	do do
Victoria ...	Grade Devon	4,072.50	171.61	245	do do
Jane	Grade Shorthorn	3,444.50	147.87	245	do do
Rose	Grade Kerry	1,520.50	49.08	60	do do
Gwen ...	Grade Friesland	725.50	25.97	30	do do
Surprise ...	do	3,053.10	114.82	120	do do
Bess	do	2,733.90	113.24	120	do do
Sheep Run Laura	do	2,264.15	102.57	120	do do
Whitesides ...	do	1,300.30	45.59	60	do do
Gwebi Sunshine	do	5,755.50	208.67	270	Govt. Farm, Gwebi
Gwebi Aglie ...	do	3,961.00	142.87	240	do do
Gwebi Janie ...	do	4,820.50	186.32	210	do do

RHODESIAN MILK RECORDS (continued).

Semi-official Milk Records (continued).

Name of cow.	Grade.	Milk in lbs. to date.	Butter fat in lbs. to date.	No. of days.	Name and address of owner.
Gwebi Polly ...	Grade Friesland	2,893.50	112.91	210	Govt. Farm, Gwebi
Gwebi Mabel ...	do	5,263.50	174.53	210	do do
Elsie	do	6,501.00	211.05	180	do do
Gwebi Fairy ...	do	3,640.00	121.85	180	do do
Gwebi Allie ...	do	2,463.00	100.45	150	do do
Clara ...	do	3,987.50	131.36	120	do do
Gwebi Weather	do	3,565.50	113.47	120	do do
Gwebi Gypsy ...	do	2,502.00	93.20	120	do do
Gwebi Veda ...	do	3,109.50	94.49	120	do do
Gwebi Gay ...	do	3,752.00	125.14	120	do do
Gwebi Surprise	do	1,323.00	51.73	60	do do
Gwebi Flora ...	do	1,944.00	63.51	90	do do
Gladys ...	do	2,233.50	64.74	60	do do
Gwebi Antbloem	do	679.50	20.65	30	do do
Gwebi Beauty	do	1,895.00	65.96	60	do do
Palm Tree Allie	do	904.50	24.69	30	do do
Gwebi Bourch	do	848.00	30.70	30	do do
Gwebi Fanny	do	872.00	32.53	30	do do

Farming Calendar.

June.

BEE-KEEPING.

At this season hives require to be painted; the woodwork, being exceedingly dry, is in good condition to receive it. Linseed oil (unboiled) is the best kind to mix with white lead, as it is more penetrating, acting as a better preservative than boiled oil. Bees will be able to take beneficial flights during warm days, so that dysentery need not be anticipated.

CITRUS FRUITS.

Cultivation of the grove is to be continued. Early ripening fruit must be harvested and marketed without delay. Mid-season varieties will be fit for packing early in the month. These should be shipped as early as possible, so as to extend the late variety export season as much as possible. Most late ripening varieties will require irrigating during the month.

A small amount of pruning should be done. If fumigation is to take place, remove the small branches that touch the ground, cut out all dead wood and water shoots.

COTTON.

In cleaning up the cotton fields care will have to be exercised in the supervision of the pickers. The cotton harvested at this period of the season generally comes from late bolls naturally matured and those prematurely opened by the cold weather and frost. The matured seed cotton should be kept entirely separate from the immature seed cotton. There will also be some dirty and stained cotton in this final picking. Arrangements for next season's seed requirements should receive consideration.

CROPS.

Select seed from the very best of your own crops. It is always wise to keep more seed than you may need for planting. Do not shell and ride your maize to the railway unless it is fit for export or market. If in doubt regarding the moisture content of the maize, send a 2 lb. sample in an air-tight tin, such as a golden syrup tin, to the Agricultural Department and have it tested. Provide ample dunnage for your maize stacked at the railway or on the farm. Use maize cobs; husks are almost useless for this purpose. Sew your bags of maize according to the export regulations and stack them properly at the railway side, leaving plenty of room between the double rows. Select pumpkin and melon seed from the best specimens. Support your agricultural show and make it a success by preparing and entering as many exhibits as you can. No one is more to blame for a poor show than the farmers themselves. Make a list of the seed requirements for next season, and where purchases must be made, place the orders early.

Veld fires must be anticipated, and if not already attended to, the mowing or burning of fire-guards, both boundary and internal, should be proceeded with.

DAIRYING.

At this time of the year the farmer should experience very little difficulty in producing cream of first-grade quality. During the winter months the separator should be adjusted so as to deliver cream testing 40 to 45 per cent. butter fat.

On exceptionally cold days care should be taken that the milk is not allowed to become too cold before separation—for efficient skimming, the milk should be separated immediately after milking and at a temperature not lower than 90 degrees F.

Farmers engaged in butter-making are usually successful in obtaining a good grain and firm body in butter at this season of the year. During cold weather it is frequently necessary to warm the cream for churning. The most satisfactory method of warming the cream to the proper churning temperature is to place the bucket or receptacle containing the cream in a tub or bath of water at a temperature of about 95 degrees F., stir the cream frequently and replace the water when cold.

Under the cool conditions which obtain from this time of the year onwards, cheese-making operations are usually most successful.

Care should always be exercised, however, in using evening's milk. If the milk is over-acid it should not be used, or a hard, dry cheese will result. Morning's milk plus a starter usually gives the best quality of cheese. The starter should have a clean sour taste and smell. In early winter, milk for cheese-making frequently contains a high percentage of fat, and in order to firm the curd properly in the whey it is usually necessary to raise the scalding temperature a few degrees.

At this period of the year winter feeding of dairy stock should commence in real earnest. The milking cows should now be in fairly good condition, and in order to maintain a full flow of milk throughout the cold, dry months of winter, it is essential that liberal feeding be practised. As far as possible an attempt should be made to imitate summer conditions by feeding an abundance of succulent and palatable food. Maize silage, sweet potatoes, pumpkins, etc., are very useful for this purpose, but these feeds should be supplemented by dry roughage of good quality, preferably a legume hay, and a liberal allowance of mixed concentrates.

For dairy heifers, weaned calves, etc., there is possibly no better ration than one consisting of maize silage, legume hay and mixed concentrates, and these feeds, if supplied in liberal quantities, should serve to keep the young stock in a thrifty, growing condition.

DECIDUOUS FRUITS.

General pruning may be done this month if the leaves have fallen. This should be confined, as far as possible, to the thinning out of diseased, weak, broken and dead shoots.

Tall trees may be reduced in height, and old and unprofitable trees headed back to induce the growth of new fruiting wood.

Trees that shed their leaves late may be pruned in July. The necessary preparations for planting trees should be completed during the month and planting commenced towards the end of the month.

Cultivation should be continued.

ENTOMOLOGICAL.

Cabbage Family.—Plants of this family suffer from cabbage louse and Bagrada bug during June.

Onions.—Suffer from thrip. The transplants may be dipped as far as the roots in tobacco wash or paraffin emulsion to keep down the pest.

Fig.—The winter crop of fruit is liable to suffer from fig weevil. The infested fruit should be collected and destroyed. If this has been done regularly with the first crop, the second crop is not likely to suffer much.

FLOWER GARDEN.

Annuals for early spring flowering should be sown, preferably in paraffin tins cut lengthwise, in a place sheltered from the wind. Perennials, shrubs and ornamental tree seeds may also be sown. Fruit trees, shrubs and roses should be pruned and all dead wood removed. Sweet peas require constant attention.

VEGETABLE GARDEN.

All the available space in the garden should now be thoroughly trenched and manured, the soil being well worked and loosened. Vegetables planted out for winter crops should be well and continuously cultivated, which will help to bring them along quicker and with less watering. Late-bearing tomatoes should be sheltered from the cold winds by a grass shield. Beet, radish, carrot, parsnip, turnip, onion, leek, mustard, cress and tomatoes may be planted.

FORESTRY.

Care should be taken by further ploughing of land or burning of grass that all fireguards round plantations are in good order and effective. Thinnings where necessary may be continued, and fellings which are to be made are to be carried out. Cuttings may be taken and struck now of deciduous trees, such as the Carolina poplar. The pricking out of conifer seedlings into tins should be continued, and sowing of such seed for the coming planting season may be completed. A commencement may be made of preparation of land to be planted during the ensuing season, e.g., by stumping if necessary, and ploughing where practicable.

GENERAL.

Grazing is deteriorating, and the next few months may be a period of difficulty for the rancher. It is a mistake, frequently seen, for all the grazing nearest to the drinking places to be first consumed, so that later on the cattle, when least able to endure fatigue and when the grass is in any case most scanty and dry, have furthest to walk from the feeding ground to water. A little forethought can obviate this trouble. Live stock are usually in good condition at this time of year and able to travel longer distances to water than may be the case later on in the season. Fire guards to prevent grass fires should be looked to.

POULTRY.

The poultry keeper must be on the look-out for sudden cold snaps, for if some precautions are not taken, the production of eggs will drop. Iron houses without a good thick layer of grass on the top and round the sides are very cold at night for the birds, and not only will the egg output drop, but the birds will very likely contract congestion of the lungs, bronchitis or pneumonia.

Cold weather, too, is likely to affect the breeding stock and cause infertile eggs. A little extra crushed mealies added to the evening feed on cold days, or a little barley softened with hot water, will keep up the body heat of the birds.

This is one of the poultry keeper's busiest periods, but method, cleanliness and attention to details pay him well. Do not leave anything that you can spare the time to do yourself to natives. Watch carefully your breeding birds, and on the slightest sign of one going off, take him or her away; if left, you will have infertile eggs, weak germs, weak chicks difficult to rear, and later weak and unprofitable stock. See that the male bird has all the food he requires, and give him a meal by himself twice a week, also a small piece of raw meat three times a week. Those who are using incubators should watch the temperature of the room on cold nights, for variations in temperature result in delayed and poor hatches, and often deformed chicks.

STOCK.

Cattle.—Where it is necessary to move cattle to fresh pasturage, this should not be unduly delayed. Cows with autumn calves should be kept in the more sheltered paddocks. A watchful eye should be kept on all watering places in order to prevent their being fouled or stopped up. Bulls should be kept out of the herd until the end of July at least, and, in the meantime, they should be well fed and cared for in order to fit them for their work. The three watchwords in the dairy herd should be feed, shelter and bedding from now onwards. Ensilage will now be found invaluable, as also will pumpkins, majordas or any other form of succulent food. Good hay should be used to rack up with at night, and the maize ration should be supplemented with ground nuts, ground nut cake or bean meal. Young calves are better in the pens on very cold mornings until the sun has gained some power, when they may run on short sweet veld for a few hours. The above remarks with regard to dipping and water supply apply equally to dairy as to ranching herds.

Sheep.—Sheep are best kept on the high veld for a while longer. If grass seeds are troublesome, a grazing area should be mown. If the rams were put into the flock in May, they should now be removed. Ewes with lambs will benefit by a few handfuls of mealies, and perhaps ensilage. They should be provided with shelter from cold winds.

TOBACCO.

The grading of tobacco should be proceeded with. Any bales stored on the farm should be turned occasionally, especially where more than one bale is placed on another. Arrangements for the grading of tobacco seed should be made for the coming season. Growers purchasing tobacco seed should place orders early with distributors of reliable seed.

VETERINARY.

Horse-sickness should be practically over now. Redwater and gall-sickness occur all the year round, but the worst time is the summer, when ticks are prevalent. Blue tongue should be very little in evidence now. Inoculation can be carried out now. Scab is a poverty winter disease.

WEATHER.

Casual rains may occur, but except on the eastern frontier, none is to be reckoned upon, nor can it be regarded as seasonable or desirable. Frosts generally occur on a few nights during the month of June, and precautions must therefore be taken. This month and the next are the coldest of the year, and when the cold is accompanied by dull weather or "Scotch mist," known locally as "guti," it is apt to have a severe effect on live stock, especially if grazing should at the same time be scarce and water supplies far to travel to.

July.

BEE-KEEPING.

The warmer bees are kept during this month so much the stronger will they come out in the spring. Provide a thickness of 3 inches of cloth coverings over the frames, and where quilts are, on examination, found to be damp, replace them with dry ones. This is a favourable season to carry out repairs to hives. All section and shallow frame combs must be carefully stored away from ants and mice, as these will be wanted for the excellent honey to be stored in them next October, collected from the bush bloom.

CITRUS FRUITS.

Mid-season oranges should be harvested and marketed this month; late varieties should be fit to export by the middle of the month. The dead wood should be broken and cut out of all harvested trees; this will minimise mechanical injury occurring with next season's fruit. Trees that are to be fumigated should have the lower lateral branches that touch the soil removed. Trim the trees until all foliage is just clear of the ground. The irrigation of late varieties must be continued and the cultivators kept going. Mark all trees when in fruit if the quality is bad; these may be cut back in August for top working to a good quality fruit. The soil of the early and mid-season varieties may be allowed to become fairly dry, for irrigation of the harvested trees may start an out-of-season growth which will enable pests to flourish and increase for the main spring blossoming flush.

CROPS.

Support agricultural shows, and add to your list of exhibits. Advertise your goods through the shows. Interested people will see them. If you require to make purchases of seed for next season, judge by the exhibits on the show what grower can best supply your needs, and place your orders accordingly. Attend the shows and go there to learn all you can about your business, not merely to have a good time. Seed maize previously selected in the field should be butted and tipped and hand shelled. Keep the butt and tip grain for check-row planting by hand. Do not over-irrigate winter crops, and do not irrigate when the wind is from the south, as this often means frost at this time of year. Troublesome weeds, such as darnel grass or drabok, may be removed from cereal crops by hand. Ploughing should be pressed on with, and maize stalks and roots of maize and other trash from the crop should be collected and burned very thoroughly. A land littered with unburnt and unrotted stalks and roots cannot be brought to a suitable tilth for planting and subsequent cultivation. Silage and sweet potatoes and other succulent feeds will have come into general use now, the potatoes being lifted from the land as required. The application of phosphatic fertilisers which are to be ploughed or harrowed in can be begun. Take the opportunity, during this and the next month or two, of inspecting all boundary and paddock fencing and gates, and effect repairs where required. Give a coat of paint to implements, wagons and carts. This protects the woodwork from rotting and the iron from rust.

DAIRYING.

This is one of the coldest months of the year, and milk production as a rule is low. Those cows which are being milked should receive a full winter ration of succulents (ensilage, pumpkins or majordas), hay and concentrates. Milking cows should either be under shelter at night or kraals should be sheltered against cold winds. The old adage, "Shelter is as good as a meal," should be remembered throughout the winter months.

No difficulty should be experienced in producing first-grade cream at this time. In cold, windy weather due precautions should be taken to ensure that the milk when separated is not below 90 degrees.

Most cheese-makers cease their cheese-making operations at the end of the month, as the milk generally not only is scarce, but begins to be deficient in butter fat. Cheese in the store-room should be carefully watched, as cheese mite is likely to appear on old mature cheese. In order to prevent the undue drying out of the cheese, the floor of the cheese room should be sprayed with water from a watering can.

Butter-making is sometimes difficult because of the low temperature of the cream. The temperature should be raised by immersing the can in warm (not hot) water until churning temperature is attained.

DECIDUOUS FRUITS.

Pruning must be continued, and if possible completed this month. The planting of all varieties is best if done now. Add a liberal amount of water at planting time, then cultivate the basins. Sufficient moisture will be thus retained to keep the newly planted trees going until they start active growth. Repeat waterings when necessary. If trees arrive from the nurseryman in a dry and withered condition, immerse them in water for twelve or more hours until they regain turgidity; then plant. Running water is best. Keep cultivators going. It will be advisable to irrigate all trees towards the end of the month.

ENTOMOLOGICAL.

Cabbage Family.—Plants of this family suffer from cabbage louse and Bagrada bug during July.

Onions suffer from thrip. The transplants may be dipped as far as the roots in tobacco wash or paraffin emulsion to keep down the pest.

Fig.—The winter crop of fruit is liable to suffer from fig weevil. The infested fruit should be collected and destroyed. If this has been done regularly with the first crop, the second crop is not likely to suffer much.

Maize Beetle.—Infested lands to be thoroughly ploughed throughout the winter.

FLOWER GARDEN.

Seeds of most annuals, perennials, shrubs and ornamental trees may be sown. The pruning of roses should be attended to early. Dahlias and other summer-flowering bulbs should be taken up, divided and replanted. Sweet peas require attention and staking.

VEGETABLE GARDEN.

Sow turnips, beans, peas, onions, cabbage, beet, carrots, parsnips, radishes, lettuce and spinach.

FORESTRY.

Care should be taken to protect all plantations from fire by hoeing belts round them and burning any grass likely to be dangerous. Cuttings of various deciduous trees may be taken and struck in nurseries. Continue pricking out conifers into tins or beds. In preparation for early planting in case the season is favourable, limited sowings of tree seeds may be carried out. If labour is available, preparation of land for planting to be taken in hand.

GENERAL.

Veld fires must be watched for and arrangements made to combat them. The loss that may result and the penalties under the Herbage Preservation Ordinance are to be borne in mind. Fire guards should this month be burnt round all grazing which it is desired to preserve for use later on.

POULTRY.

With the cold weather that we generally have in July, the birds should have extra food, i.e., barley or maize, if the supply of eggs is to be continued. A mixture of stewed linseed and bran should be given to the birds, warm, the last thing before they go to roost. This gives them a little extra food during the long and cold hours of the night at this time of the year and maintains the body heat. A certain amount of shelter is also necessary to protect them from the cold winds. Grass wind breaks about 3 feet high on the windward side of the run are sufficient. Remember that no chickens should be hatched after August; those hatched later take much longer to develop than those hatched before August, and they are usually stunted, weakly and unprofitable. Each month the young stock should be gone through and graded; anything that does not promise to be good should be got rid of. As the hatching season draws to a close, the breeding stock, if not carefully watched and treated, will become

run down, and infertile eggs and weak chicks will be the result. Watch the breeding stock carefully and handle them occasionally; if they feel thin and light or the flesh is not hard but flabby, give extra food and more scratching exercise. The male especially should be well looked after and given a meal on three or four days of each week by himself; in addition, he should have some raw meat as often as possible. Good hatching and strong, healthy chicks are wanted right up to the end.

Turkeys should now be in full lay. Never disturb the hens when they are sitting. They are very sensitive and nervous, and unless left mainly to themselves, are apt to desert the eggs or break them. It is recommended that turkey chicks be reared by hand; the hens are poor mothers, they are clumsy, drag their chicks all over the place, and do not feed them as well as an ordinary hen does. The main thing is to keep the young turkeys warm, give them plenty of fresh air, thick separated milk and chopped onions or onion tops.

STOCK.

Cattle.—On ranches the advice given for June applies still. The bulls may again be put into the herd at the end of the month. If grazing has been reserved for the winter months, it will probably be wise to turn the cattle into it now. Watch for any unthrifty cattle, and get them into the home paddock and feed them before they become really poor.

Sheep.—Vleis should now be fairly dry and may be utilised; otherwise the advice given for June applies.

VETERINARY.

Horse-sickness and blue tongue should now have disappeared. Redwater and gallsickness occur all the year round, but the worst time is during the summer, when ticks are prevalent. Sheep may be inoculated against blue tongue now. Scab in sheep will probably be in evidence this month.

WEATHER.

Though rains have fallen during every month of the year in Rhodesia, none is looked for or desired this month. Most stations record an average of .01 to .3 inch over a number of years. Severe cold is likely to occur at this time of year, the lowest temperatures occurring an hour or two before sunrise. Frosts may be looked for, especially on calm clear nights. Cold windy days and damp "guti" weather tell severely on cattle, if shelter and food are not provided.

Notes from the "Gazette."

"Gazette" Date.	Items.
	POUND.
9.5.30.	The pound at Grasslands Farm, Chilimanzi, has been abolished and one established on Felixburg Farm in the same district. (G.N. 296.)
	PRODUCE EXPORT ORDINANCE, 1921.
16.5.30.	White hominy chop and white and mixed maize feed are declared produce within the meaning of the above Ordinance. Regulations for the inspection and grading thereof are contained in Government Notice No. 307.
	DEVIATION, CONCESSION-UMVUKWES ROAD.
16.5.30.	The Government intend to deviate the district road gazetted under Government Notice No. 59 of 1913 as under :— From the eastern corner of Puncheston; thence along the south-western boundary of Fochabers for a distance of one mile: thence in a northerly direction to the common boundary of Fochabers and Collingwood B, 230 feet from the common beacon of Fochabers, Collingwood B and Excelsior; thence across Collingwood B to the Garamapudzi low level bridge; thence across Manangas and along the north-eastern boundary of The Rivers to the Satsi low level bridge on Wengi River Estate. Any persons having objection to the described deviation are required to lodge, on or before the 16th August, 1930, such objections at the office of the Secretary for Mines and Public Works.

Departmental Bulletins.

The following Bulletins, consisting of reprints of articles which have appeared in this Journal, are available for distribution free of charge to applicants in Southern Rhodesia only. Outside Southern Rhodesia, 3d. per copy.

AGRICULTURE AND CROPS.

No. 174. Notes on Hop Growing, by H. G. Mundy, F.L.S.
No. 225. Napier Fodder or Elephant Grass, by J. A. T. Walters, B.A.
No. 278. New Crops for Rhodesia, by J. A. T. Walters, B.A.
No. 362. The Cultivation of Rice, by H. G. Mundy, F.L.S.
No. 374. Fibre Crops, by J. A. T. Walters, B.A.
No. 403. Florida Beggar Weed, by H. G. Mundy, F.L.S.
No. 429. Propagation of Kudzu Vine, by H. C. Arnold.
No. 442. Swamp or Irrigation Rice, by K. V. Yoshi, Bombay.
No. 510. Check-row Planting of Maize, by H. G. Mundy, F.L.S.
No. 513. The Carob Bean in Rhodesia, by J. A. T. Walters, B.A.
No. 541. The Potato Crop under Irrigation, by G. R. Syfret.
No. 545. Artificial or Synthetic Farmyard Manure, by H. G. Mundy, Dip.Agric., F.L.S.
No. 550. Onion Growing under Irrigation, by C. Mainwaring.
No. 561. Wheat Growing in Rhodesia, by C. Mainwaring.
No. 568. The Treatment of Arable Land, by G. N. Blackshaw, O.B.E., B.Sc., F.I.C.
No. 581. Leguminous Crops for Stock and Soil Improvement in Southern Rhodesia, by C. Mainwaring, Agriculturist.
No. 590. Rye, by H. W. Hilliard, Junior Agriculturist.
No. 591. Maize Export Conference Proceedings.
No. 598. Drought-resistant and Early-maturing Crops for Areas of Late Rainfall, by C. Mainwaring.
No. 599. Rhodesian Soils and their Treatment, by E. V. Flack.
No. 601. Maize for Export, by S. D. Timson.
No. 603. The Production of Maize in Southern Rhodesia, by C. Mainwaring, Agriculturist.
No. 627. The Growing of Potatoes in Southern Rhodesia (Revised), by C. Mainwaring, Agriculturist.
No. 630. The Storage of Seed Potatoes, by H. C. Arnold.
No. 634. Barley, by P. V. Samuels.
No. 643. Noxious Weeds in Southern Rhodesia, by F. Eyles, Botanist.
No. 650. Coffee Culture in Southern Rhodesia, by G. W. Marshall, Horticulturist.
No. 651. Two Important Leguminous Crops: The Velvet Bean and Dolichos Bean, by C. Mainwaring, Agriculturist.
No. 656. Tractor Notes, by A. W. V. Crawley, M.E., F.G.S.
No. 657. Hay-making in Southern Rhodesia, by C. Mainwaring, Agriculturist.
No. 663. The Use of Fertilisers and Manures in Southern Rhodesia, by A. D. Husband, A.I.C., Chief Chemist.
No. 672. Hay-making in Rhodesia, by H. G. Mundy, Dip.Agric., F.L.S.
No. 674. Top Dressing of Maize against Stalk Borer, by H. C. Arnold.
No. 681. The Sunflower (Helianthus Annuus) (Revised), by S. D. Timson, M.C., Dip.Agric.
No. 684. Warning to Maize Growers: Maize for Export.

No. 685. Notes on Farm Practices at the Government Farm, Gwebi, by S. D. Timson, M.C., Dip.Agric.
No. 694. The Edible Canna (Canna Edulis), by D. E. McLoughlin.
No. 695. The Castor Oil Plant (Ricinus spp.), by S. D. Timson, M.C., Dip.Agric.
No. 697. Results of Analysis of Samples taken under the "Fertilisers, Farm Foods, Seeds and Pest Remedies Orrdinance" during the year 1927-28.
No. 700. Further Notes on Farm Practice at the Government Farm, Gwebi, by S. D. Timson, M.C., Dip.Agric.
No. 704. The Importance of Research on Pasture Improvement in Southern Rhodesia, by A. D. Husband, A.I.C., Chief Chemist.
No. 705. Suggested Cropping Programmes for Farms on the Sand Veld, by D. E. McLoughlin, Assistant Agriculturist.
No. 706. A Farmers' Calendar of Crop Sowings, by C. Mainwaring, Agriculturist.
No. 708. Witch Weed or Rooibloem (Striga Lutea)—a Serious Menace to Maize, by J. A. T. Walters, B.A., F.R.S.A., Agriculturist.
No. 709. Sand Veld Farming and its Possibilities, by E. D. Alvord, M.Sc. (Agr.).
No. 710. Monthly Reminders for the Farming Year, by the Division of the Chief Agriculturist.
No. 713. Ensilage, by J. A. T. Walters, B.A., Agriculturist.
No. 724. Ploughing by Tractor, by A. W. V. Crawley, M.E., F.G.S.
No. 727. Farmyard Manure, by A. P. Taylor, M.A., B.Sc., Agricultural Chemist.
No. 743. Sunn Hemp, by S. D. Timson, M.C., Dip.Agric.
No. 750. Cotton in Southern Rhodesia—Hints to Growers, by G. S. Cameron, Empire Cotton Growing Corporation.
No. 751. The Sweet Potato, by S. D. Timson, M.C., Dip.Agric. (Wye).
No. 757. Maize on the Sand Veld: Results at the Tobacco Experiment Station, Salisbury, by C. A. Kelsey-Harvey, Manager.
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No. 702. Book-Keeping on the Farm, by T. J. Needham, Acting Accountant, Agricultural and Veterinary Departments.

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No. 733. Jam-making, by Miss D. Bosman, Home Economics Officer, Division of Agricultural Education and Extension, in "Farming in South Africa."

No. 764. How to Make Use of the Fencing Law

Farming Returns for Income Tax Purposes.

Land Bank Act (price 1/-).

Twelve Simple Rules for the Avoidance of Malaria and Blackwater.

Monthly meeting of Enterprise Farmers' Association, 3rd June.

THE RHODESIA

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Editor - - *William E. Meade.*

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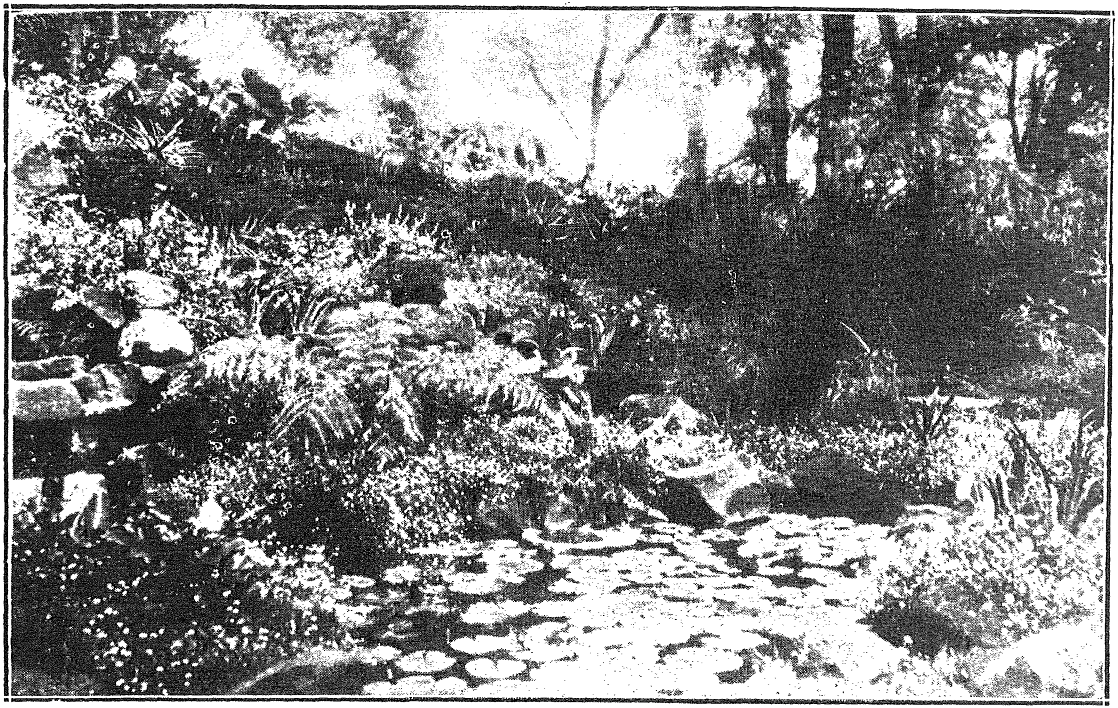
Editorial.

Contributions and correspondence regarding subjects affecting the farming industry of Southern Rhodesia are invited. All communications regarding these matters and advertisements should be addressed to:—The Editor, Department of Agriculture, Salisbury.

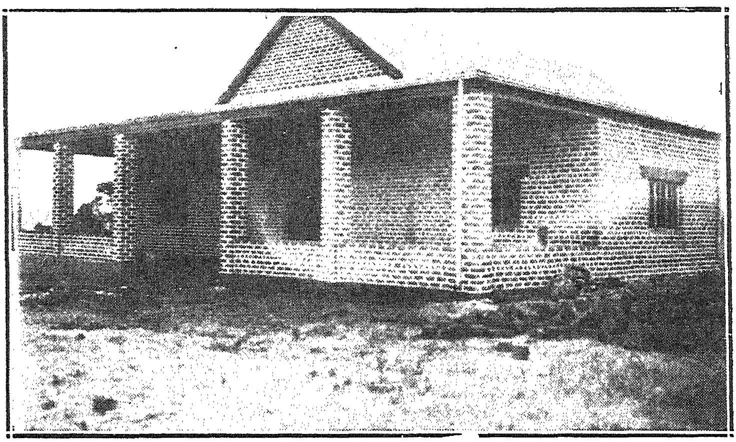
Enterprise Farmers' Association.—Our frontispiece illustration this month is of the members of this association who attended the meeting on the 3rd June. A number of well known faces are missing, such as Mr. J. Watson, of Kilmuir; Mr. J. Richardson, of Woodford, and Mr. J. A. T. Walters, of Mukwene, who for various reasons—not from modesty, we hope—were unable to be present. In the illustration, however, will be seen the figure of Mr. H. B. Christian, of Ewanrigg, who is chairman of the association and president of the Rhodesia Agricultural Union. Another illustration reproduced is that of the new farmers' hall which has been erected by the combined efforts of the members of the association and is now nearly completed. The hall will be a great asset to the community and will be the means of bringing the farmers of the district and their families into

closer social intercourse, and thus fostering the spirit of cameraderie so helpful in rural life. The hall will, of course, be used for more serious business than social gatherings and will replace the "hut" for the purpose of holding the monthly meetings of the association. We would like to throw out the suggestion that in addition to such meetings, the hall should be used for periodical gatherings of farmers convened for the specific purpose of discussing general problems of farm management, the interchange of ideas and to consider the position of agriculture in general, but more particularly as it affects the district. In this way we think much good might be achieved, over and above the general utility of the regular monthly meetings.

The Enterprise district, which lies to the north-east of Salisbury, is named after one of the early mines, which, in company with the Arcturus group, have now ceased working. There are in fact no mines left, and the district is a striking example of the permanence of agriculture as contrasted with the uncertainty of gold mining to which the district first owed its opening. It was the first area to be taken up for agricultural purposes by the early pioneers, and consists for the most part of broken and hilly country, with fertile valleys in between. The formation is mostly schist, with here and there some diorite, and in some places limestone overlying the basal granite which appears towards the north. The district is well watered and facilities for irrigation are in evidence at a number of farms. Mr. Syfret, whose farm Springs is traversed en route from Salisbury, is a large grower of irrigated crops, principally cereals, which last year yielded 425 bags of wheat and 205 bags of barley. In places the yield of wheat was as much as 14 bags an acre. He has this year 84 acres under wheat, which is now well above the ground and provides a refreshing expanse of verdant green, standing out in strong contrast to the pervading drabness of the surrounding veld. At Ewanrigg, which Mr. H. B. Christian has occupied since 1914, the yield of maize per acre has been raised to an average of 12 bags over a period of seven years. The manner in which this was achieved was described by Mr. Christian in the issue of this Journal for August, 1921. The water garden and rockery which we illustrate represent a stony kopje transformed into a scene of beauty with shady trees, trickling water, quiet pools and



Water garden and rockery at Mr. H. B. Christian's farm Ewanrigg, Enterprise district.



The Old and the New.

Above.—The Farmers' Hut at which meetings were previously held.
Below.—The new Farmers' Hall at Enterprise.

a wealth of flora collected from various parts of Africa. It is a delightful spot. Mr. H. D. Christian, on the adjoining farm Meadows, is a cousin of the president of the R.A.U. and is a pioneer of the district.

It is not our purpose to describe the activities of the farmers of the Enterprise area, but what has been written would be totally inadequate without some reference to such old-timers and progressive farmers as Mr. H. D. Rawson, of Alderley, Mr. J. Watson, of Kilmuir, and Mr. J. Richardson, of Woodford, to whose leadership in all things agricultural the district owes much.

The farmers of the Enterprise district are large growers of maize and are feeling the effects of the severe slump in prices now prevailing. As a general rule, however, they have wisely broadened their systems of farming to include such lines as dairying, pig-raising, poultry-keeping and, in a small measure, the breeding of slaughter cattle. Although times are difficult, we feel sure that the Enterprise farmers, thanks to their diversified system of farming and scientific methods of cropping, will be able to weather the storm successfully.

Our Imports.—An examination of the Customs returns for the year 1929 shows that we are still importing many commodities which to a greater or lesser extent could and should be supplied locally. For instance, our imports of wheat and flour during the year amounted in value to £109,158, and although a certain proportion was re-exported, it is obvious that we are still dependent almost entirely upon outside sources of supply for our daily bread. The values of other imports are:—Butter, £30,619; cheese, £12,057; bacon and hams, £25,306; biscuits, £26,733; deciduous fruit, £19,290; potatoes, £23,873; rice, £10,384; pickles, £2,707; oatmeal and rolled oats, £7,130; sugar, £70,191; eggs, £14,511; salad and edible oils, £2,806; common soap, £43,409; toilet soap, £13,601.

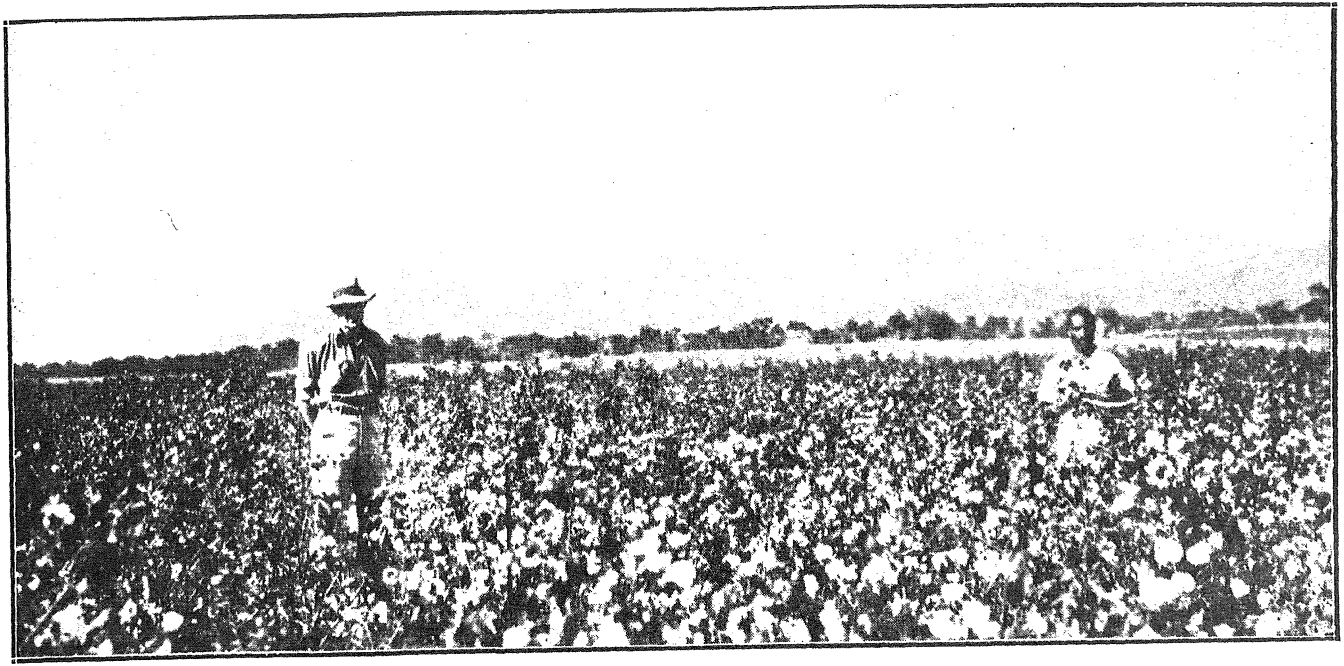
Under the heading of wood, cane, wicker and manufactures thereof we find that imports of teak were valued at £11,724; pine, £75,172; flooring and ceiling boards, £24,662; boxes (empty), £19,884; brushware, £12,022; chairs (all

kinds), £13,948; wooden furniture, £89,656; handles for picks and shovels, £3,465; hubs, spokes, felloes, etc., £5,436; joinery, £43,131; sleepers, £58,462.

It is not possible, owing to the manner in which the Customs returns are compiled, to gauge accurately the quantities retained in this Colony, but it is obvious that the bulk of the imports was for local consumption. In any case it is obvious that there is internally and within easy access a very substantial market awaiting our attention.

Cotton at Chipoli.—The photograph reproduced on the opposite page is of a field of cotton a little over 70 acres in extent at Chipoli, Shamva district. Picking started in May, and we are informed by Captain Moubray that the yield so far (10th June) has averaged nearly 1,000 lbs. of seed cotton to the acre; also that the cotton followed a crop of maize which yielded about 11 to 12 bags per acre. About 200 lbs. of rock phosphate was applied broadcast per acre before the cotton was planted. The land varied from good red loam to a much poorer soil, and Captain Moubray states that it was noticeable that the best cotton was grown on the smaller plants which grew on the lighter soil. Stainers, he says, were very numerous, but, contrary to experience elsewhere this season, boll worm was almost absent. The total rainfall was 35 inches, of which 20 inches fell before the end of December. There was a drought of five weeks' duration, including February, which was a completely dry month. Practically all this cotton was picked by women and children, and after the first two pay days applications from natives in the adjoining reserves to pick cotton were numerous. The price paid was about one-fifth of a penny per pound of seed cotton.

It is gratifying to hear of the excellent results obtained by Captain Moubray at Chipoli, but it is very necessary to state that similar results have not been obtained throughout the Colony sufficiently often to justify our considering Captain Moubray's results as being typical. The illustration does demonstrate, however, the promising nature of U. 4 cotton in the absence of severe boll worm conditions.



Seventy-five acres of U. 4 cotton grown at Chipoli, Shamva district, by Capt. J. M. Moubray. The photograph was taken in May and the yield has been at the rate of nearly 1,000 lbs. of seed cotton per acre.

Milk Recording Scheme.—This scheme, inaugurated in July, 1929, continues to receive support. At present there are two milk recorders, stationed in Salisbury and Bulawayo respectively. These officials tour their respective districts every month and check the weights of milk produced per cow and carry out butter-fat tests. For pedigree or pure-bred cattle it is necessary to conduct a butter-fat test over 48 hours, and from these tests the average butter-fat percentage of the milk of every cow is estimated. For grade or non-pedigree cows, however, tests are conducted over a 24-hour period.

The fees for these services are fixed at a very moderate rate and are charged for according to the number of tests made. For the first ten cows the charge is 6d. per test. If more than ten cows are entered, the charge after the first ten is 3d. per test. For example, if a farmer has twelve cows in test and they are tested over a period of 24 hours, i.e., two tests each, the charge is as follows:—

20 tests at 6d.	10s.
4 tests at 3d.	1s.
Total	11s.

If, however, they are tested over a period of 48 hours (i.e., four tests per cow), as in the case of pedigree stock, the charge is proportionately greater. In this case the fee for testing would work out as follows:—

40 tests at 6d.	20s.
8 tests at 3d.	2s.
Total	22s.

All fees should be paid to the recorder at the time of his visit and a receipt should always be obtained. This scheme of cash payment obviates much book-keeping, and in view of the benefits to be derived from milk recording, must always be adhered to. Full information as to milk recording is obtainable from the Dairy Officer, P.O. Box 387, Salisbury, or the District Dairy Officer, P.O. Box 566, Bulawayo.

Agriculture in Nyasaland.—We have received the report of the Department of Agriculture in Nyasaland for the year 1929, from which we see that the total acreage cropped by

Europeans in the year amounted to 60,177 acres, as compared with 62,230 in 1928 and 47,781 in 1919. Coffee has increased in extent from 492 acres in 1919 to 1,331 acres in 1929, but cotton has decreased during the period in question from 12,658 to 1,219 acres. Apropos of this crop, it is stated by the Director that it is doubtful whether cotton will ever receive as much attention from Europeans as it did prior to 1920, unless market prices advance substantially and larger yields are assured than have been customary. He does not think it probable that the small-scale trials being carried out by the cotton specialist of the Empire Cotton Growing Corporation will lead to greatly increased acreages. The Director states further that the crop in the past thrived moderately in the higher levels so long as new lands could be cleared, but this gradually became impossible, and as the organic matter in the cleared soils decreased, the cotton crop became less and less reliable. The acreage planted to tobacco by Europeans in 1929 was 19,269 acres, as compared with 22,475 in 1928 and 9,817 in 1919. The yield in 1929 was 45,788 cwts., or 266 lbs. per acre, as compared with an average of 405 lbs. in the previous year. It is stated that disease accounted for the low yield in 1929. Tea growing continues to make progress in Nyasaland, the acreage having grown from 4,840 in 1919 to 7,596 in 1928 and 8,866 in 1929. A Tea Research Association was formed towards the end of the year, and whilst its present financial resources are insignificant, it is evidence of a progressive spirit among the growers. In spite of falling prices, the sisal crop continues to develop in a satisfactory way, the acreage having expanded from 3,290 in 1919 to 7,863 in 1928 and 8,270 in 1929. Very little maize is cultivated by Europeans in Nyasaland, the acreage in 1929 amounting to 3,845, which yielded 40,117 cwts. The number of cattle owned by Europeans at 31st December, 1929, was 20,345, of which 57 were pedigree stock.

The Director finds it extremely difficult to conclude his review of European agriculture in an optimistic manner. He attributes the general fall in prices for all commodities on the world markets as due to over-production, and not to decreased demand or to inability to purchase. This being so, he thinks that comparatively little improvement may be expected in selling prices in the near future, as producers in all parts of the world are usually disinclined to decrease their output until compelled financially. He therefore lays

emphasis on the point that in order to keep the agricultural community solvent, methods must be sought whereby the cost of production can be lowered.

An Economics Branch.—In keeping with the development in most other countries, it has been found necessary to establish a Branch of Economics of our Department of Agriculture, and for this purpose Mr. J. R. McLoughlin, M.Sc. (Economics), has been seconded from the service of the Union of South Africa. Mr. McLoughlin has been trained in both agriculture and economics, and at one time was instructor in agriculture at the School of Agriculture, Potchefstroom. During the past two and a half years he has held the appointment of Economist in the Department of Agriculture at Pretoria and has had a comprehensive experience in marketing research and economic advisory work. Mr. McLoughlin took up his duties here on the 2nd June.

The field for economic research in agriculture is a wide one and it is obvious that the many problems facing the agriculturist in this Colony to-day cannot be grappled and solved in quick time. We find throughout the world lack of adjustment between production and demand for raw materials. We are sharing in the depression which such a state of affairs brings about, and the remedy is far beyond our control. However, there are many ways in which the officer now appointed can give practical help to our farmers. By close study of markets and economic conditions he can advise them on what basis to produce, the likely demand, and the tendency of that demand from time to time. He can also assist in the establishment of channels for the disposal of the farmer's produce, and by investigation give authoritative advice as to the justifiable capital to be employed for the production of one or more commodities.

Briefly it can be stated that the primary object of this appointment is to enable the farmer to dispose of his produce to the best advantage, and we feel sure that farmers will assist the officer by supplying all relevant information which will help towards this end. For the present the work of the Branch of Economics will centre mainly round the question of marketing, and for a start it is proposed to go thoroughly into all phases of the maize industry. This will be followed

by an economic investigation into the dairy and tobacco industries, which, in common with the maize industry, are suffering from the universal depression of price levels. The result of this investigation should be of material assistance to the Government and the individual in determining the policies to be followed.

We hope in due course to publish in this Journal the findings of the Economist on the matters coming within the purview of his branch.

Fourth World Poultry Congress.—Southern Rhodesia is to be represented at this congress by Mr. H. G. Wheeldon, Chief Poultry Officer, who will be absent from the Colony from 2nd June until October approximately. The congress is to be held at the Crystal Palace, London, from the 22nd to 30th July and will be attended by delegates from all parts of the world. These congresses, which are held triennially, were initiated by the World's Poultry Science Association (until recently the International Association of Poultry Instructors and Investigators) for the purposes of (1) bringing together those concerned with the development of the poultry industry and promoting international friendship; (2) pooling the best and most recent knowledge concerning the various aspects of the poultry industry in all parts of the world; (3) improving and developing poultry research, education and economics, both through papers and discussions and through national exhibits; (4) encouraging, through displays on an international basis of pure-bred poultry, the improvement of poultry stocks in all countries; (5) stimulating, through commercial exhibits, trade in all the requirements of the poultry industry. Previous congresses have been held in Holland, Spain and Canada. Five daily sessions will be held simultaneously in five different centres, the subjects for discussion being: (a) Breeding and incubation; (b) nutrition and rearing; (c) diseases and their control; (d) economics, including marketing; (e) education and general. There will be upwards of 150 papers submitted from some twenty countries, and a feature of the congress will be the depicting of various aspects of the poultry industry by specially designed films.

An international exhibition of poultry and poultry appliances will be held at the Crystal Palace in conjunction

with the congress, at which there will be a very heavy representation from all parts of the world. A post-congress tour of Great Britain and Northern Ireland will commence on the 31st July and continue until 11th August, during which period delegates will be afforded the opportunity of seeing typical examples of the poultry industry as practised in its various branches. It is interesting to note that at the previous congress held in Ottawa the total number of delegates registered was 1,932, of which 998 were from the United States, 787 from Canada, 53 from England, 19 from Holland, 13 from Bermuda, 12 from Italy, whilst 22 countries were represented by delegates varying in number from 1 to 9. In addition to these, there were 677 non-registered delegates.

These international congresses have exercised a great influence on the development of the poultry industry throughout the world, and we have no doubt that the first hand information which Mr. Wheeldon will acquire of latest methods will be a valuable aid to him in his work of assisting the progress of our poultry industry.

The Imperial Institute.—The annual report of the Imperial Institute for the year 1929, recently to hand, is a record of further valuable work performed on behalf of the Empire. It will be remembered that in the issue of this Journal for June, 1929, we explained in some detail the objects of the Institute and showed in what manner it can help persons concerned with the development of the raw materials throughout the Empire. The report now before us shows that the resources of the Institute were made use of during the year by persons in this Colony, although not to the extent that might be expected by a young Colony such as ours, rich in raw materials and seeking opportunities for development. We see that the Institute reported on mica from Southern Rhodesia, the possibilities of producing power alcohol from maize and other products available in the Colony, and supplied information as to the marketing of concentrated orange juice in the United Kingdom. Beyond this, apparently enquiries from this Colony called for no special mention. It may be well to repeat what we wrote last year to the effect that the Institute maintains a special service for dealing with enquiries relating to the sources, production, uses and marketing of raw materials, and for collecting and

disseminating general and statistical information on these subjects. This service is available for the use of individuals and firms, as well as of Government Departments, without charge.

The laboratories of the Institute are specially equipped for the chemical and technical examination of raw materials of all kinds. Full reports are furnished on the composition, uses and value of materials submitted. By its close association with the users of raw materials the Institute is able to arrange large-scale trials of promising materials when necessary. Special analyses and investigations are undertaken for firms or private persons in any part of the Empire on payment of appropriate charges.

We note from the report that during the year the attendance of the public in the galleries of the Institute numbered 397,598, and that a special series of 39 lectures on Empire countries and their products were given and attended by 12,230 persons, the majority of whom were school children in organised parties. A cinema in which films of Empire scenery, life and industries are displayed constitutes part of the educational work of the Institute and attracted an average attendance of 5,082 persons per week for 48 weeks. The cinema, it should be stated, is maintained by the Empire Marketing Board.

We see no reference to the Southern Rhodesia Court in the present report, and presume that the re-organisation referred to in the previous report, and for which a special grant was made by the Government, has been accomplished. Visitors to the Old Country from Southern Rhodesia would do well to make a point of visiting the Imperial Institute, which is situated at South Kensington, and seeing for themselves the many features of interest to be viewed.

Maize for Export.

In the June issue of the *Rhodesia Agricultural Journal*, page 632, it was stated that all maize intended for export shall be contained in new $2\frac{1}{4}$ *lbs.* A quality 8 x 8 twill bags. It should have been stated that the weight of the bag must be $2\frac{1}{2}$ *lbs.* and not $2\frac{1}{4}$ *lbs.* as printed.

Dairying in Southern Rhodesia.

AN EXPERIMENT IN THE FEEDING OF DAIRY COWS.

By R. R. SHARP, Redbank, near Bulawayo.

[We feel sure that the following article will be of great interest to all dairy farmers.

"Whinburn" Farm is 3,000 acres in extent and is situated about 24 miles from Bulawayo on a formation consisting chiefly of Kalahari sand. The grazing is good and the farm is well watered. Major Sharp has been on "Whinburn" for seven and a half years and commenced dairying operations in 1923. The foundation stock consisted of six grade Friesland cows and a good Friesland bull. The following year eight appendix cows were obtained, and in 1926 the herd was further increased through the purchase of four good grade cows. In 1926, six pedigree cows were imported from the Union of South Africa. Major Sharp has, therefore, been grading up his stock for approximately seven years, using well bred bulls. Milk records have been kept throughout this period and strict "culling" has been practised. Dairy stock at "Whinburn" are well cared for, and it is obvious from casual observation that farming operations are conducted in an efficient and practical manner. Housing for cows and calves has been erected and seven paddocks have been established, three of which are eight acres in extent, the remainder varying in size from forty to fifty acres. Heifer calves are hand reared and grade bull calves are destroyed.

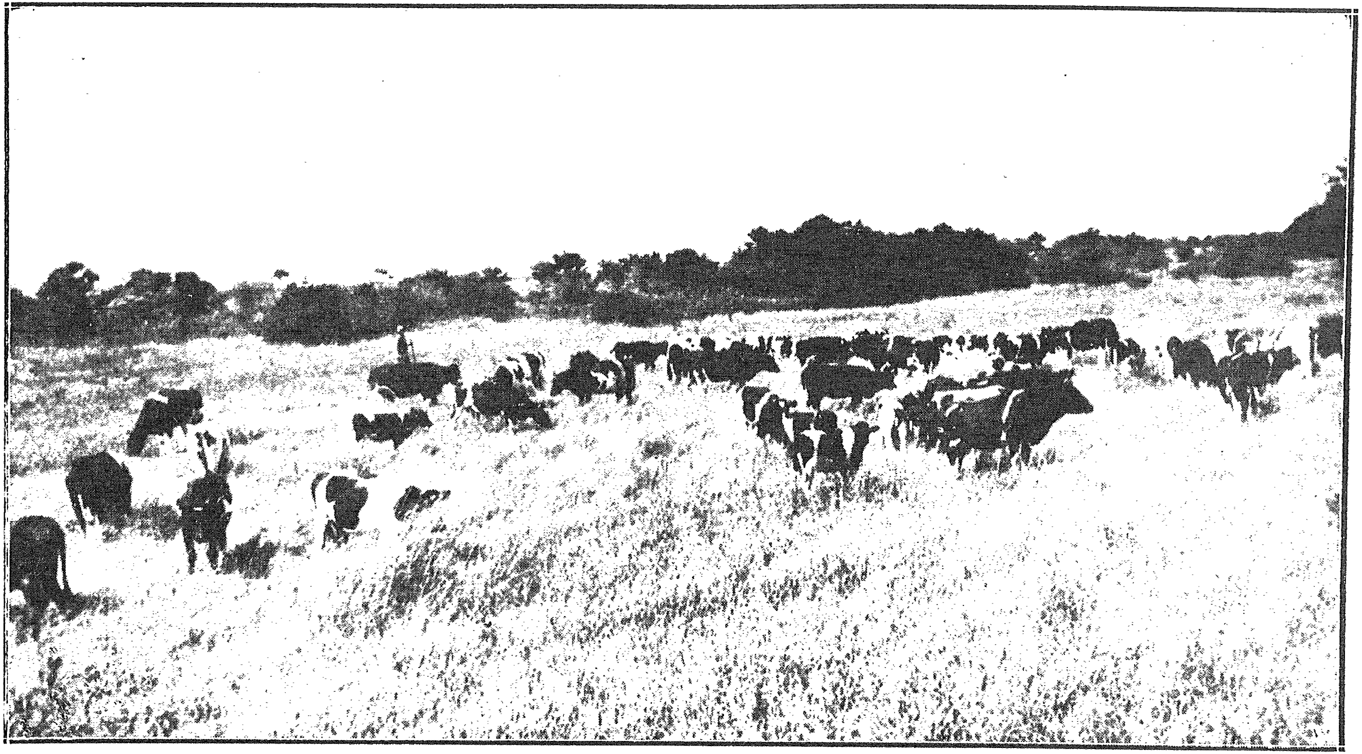
The total acreage under cultivation is 400 acres, the chief crops being maize, sunflowers, ground nuts and legumes. From 75 to 80 acres are sown to grain crops, silage, cowpeas, ground nuts, etc., for stock feed.—Editor.]

During the past year the writer has attempted to adapt to Rhodesian conditions the system introduced in England by Mr. R. Boutflour for the feeding of dairy cattle, and it has been suggested that the results of these experiments might be of interest to other farmers. The point which must be emphasised in this system is that the total dry matter and fibre fed to any individual cow must be controlled. A cow of average weight (say 11 cwt.) can economically deal with about 33 lbs. of dry matter per day, and smaller cows in proportion. This quantity of food must contain sufficient food nutrients to maintain the animal and provide the constituents of the milk produced.

A production ration of $3\frac{1}{2}$ lbs. of concentrates (containing 0.6 lb. protein) is given for each gallon of milk and the remainder of the ration is given in the form of roughage, preferably good hay. It therefore follows that an 11 cwt. cow producing four gallons of milk will receive 14 lbs. of concentrates and 19 lbs. of hay per day; if, however, the cow weighs only 8 cwt. she will still receive 14 lbs. of concentrates, but her hay must be reduced to 10 lbs., making a total of 24 lbs. food, which is in proportion to her weight.

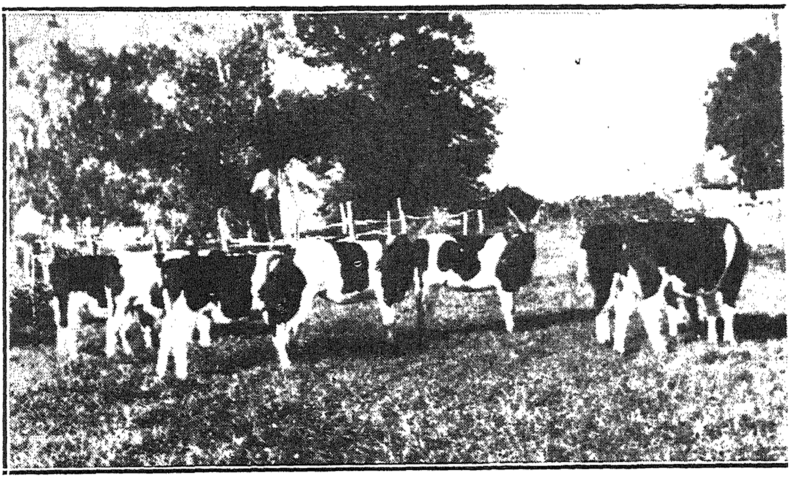
Mr. Boutflour maintains that the maximum yield of milk can be produced by his system and that a cow which consumes more than the quantity laid down will suffer from indigestion and will be unable to give of her best when in this condition. He also condemns as unnecessary and wasteful the feeding of large quantities of roots (represented in Rhodesia by pumpkins, etc.). Their only function is to hasten the passage of excessive quantities of inferior food through the alimentary canal, and in doing this they also hasten the passage of the valuable concentrates, which are consequently only partially digested and find their way to the manure heap. This extra strain on the digestion not only diminishes the milk flow, but also shortens the life of the animal.

Another factor contributing to high production is "steaming up" or liberal preparation of the cow for her lactation. This is done by feeding gradually increasing quantities of concentrates for about six weeks before calving, so that when the cow calves she is already receiving a ration proportionate to her expected yield of milk.



The "Whinburn" herd of Friesland.

A few of Major Sharp's Frieslands. These cows were used for the feeding experiment.



A few of Major Sharp's hand-reared Friesland calves.

In adapting the system to Rhodesian conditions, the following foodstuffs were available:—

Maize,
De-seeded sunflower heads,
Maize silage,
Ground nut hay,
Cowpea hay,
Veld hay,

all produced on the farm, and ground nut cake exchanged for ground nuts, also home grown. Salt and bone meal were therefore the only things purchased.

A concentrate mixture composed of 3 parts maize, 1 part sunflower heads, 1 part cake was employed and fed at the rate of 3½ lbs. per gallon of milk; this contains approximately 0.25 lb. oil, 0.58 lb. crude protein and 1.92 lbs. carbohydrates. The protein is on the low side, but it was considered that the high protein content of the legume hays could compensate for this. The roughage was made up of approximately 50 per cent. legume hays and 50 per cent. veld hay or silage (calculated as dry matter). A measure holding 3½ lbs. concentrates was employed, and another holding 15 lbs. silage, while the hay was all in bales of about 70 lbs., which saved considerable waste in handling and facilitated feeding, as the bale can be allocated to so many cows, thus obviating weighing out rations. The cows were grouped roughly according to size and production, and consequently the rationing was extremely simple and could be carried out by natives with a minimum of white supervision. Finally, no winter grazing was permitted. The cows went out three or four times a day to water, but were given no opportunity of grazing until the advent of rain and spring grass.

The results of the experiments were most encouraging. The cows, which were appendix and grade Frieslands and of all ages, calved down mostly between May and August. No calving trouble was experienced, even in the cows which had been fed entirely on a dry ration without ensilage. The increase in production ranged from 25 per cent. to 50 per cent. over previous lactations, the cows remained in perfect condition, and, with only one or two exceptions, none returned to the bull after service.

The concentrate mixture used was approximately the same as in previous years, and the quantity of this increased, of course, in proportion to the increased milk yield. The quantity of hay used was about the same, while in ensilage, which had previously been fed more or less *ad lib.*, an economy of about three tons per cow was effected.

Numerous changes were introduced into the ration from time to time and the effects noted. It was found that yields could be decreased immediately by (1) increasing the total bulk fed or by allowing grazing, (2) by feeding large quantities of majordas and pumpkins, (3) by withholding water or giving inferior water, (4) by milking less frequently. In the case of (1) and (2) the milk dropped at once and undigested concentrates appeared in the dung. Young cows appeared to be most affected by (1) and (2), and high producers by (3) and (4).

Increased yield was obtained by providing water in the byre accessible at any time, and it was found profitable to milk three times a day for cows giving over three gallons per day. The quality of the water was found capable of affecting the yield by 15 to 20 per cent.

Dipping produced an average fall of 12 per cent. in the milk over 24 hours, after which the yield returned to normal.

During the period between the first frosts and the first rain the cows were kept in the byre night and day, except to go out to water, but as soon as the young grass appeared they were gradually put on to grazing. This seems to be the most critical period, and the flow of milk dropped off considerably and was not recovered. In spite of every care several cases of digestive trouble were experienced, whereas nothing of the kind had occurred during the period of stall feeding.

As soon as the grass was really plentiful, concentrates were gradually reduced and were only fed for each gallon in excess of 1½, but from the beginning of February the milk yield began to drop off, and concentrates had to be increased until by the second week of March it became necessary, in order to maintain production, to feed practically for every gallon.

In the following table a comparison is made between the previous records of a few of the cows concerned and their performances during the period of the feeding experiment. The six cows listed have been recorded under the Rhodesian official milk recording scheme for the past year, and the production of each cow during the period of the experiment is therefore an official milk and butter-fat record.

It will be noted that no figures have been given for the periods for which the cows were in milk; in the case of each cow concerned, however, the lactation periods were approximately of the same duration, *e.g.*, the best previous performance of the cow Linnet, *i.e.*, 7,350 lbs. milk containing 212 lbs. butter fat, was made over a period of 300 days. Her lactation period during the experiment, when she produced 10,310.5 lbs. milk containing 293.53 lbs. butter fat, was of exactly the same duration, *i.e.*, 300 days.

Name of Cow.	Date of Birth.	Best previous Performance.		Production during Period of Experiment.		Total Increase in Yield.		Percentage Increase.	
		Lbs. of Milk.	Lbs. of Butter Fat.	Lbs. of Milk.	Lbs. of Butter Fat.	Lbs. of Milk.	Lbs. of Butter Fat.	Milk.	Butter Fat.
								Per cent.	Per cent.
Buttercup ...	1920	6046.0	212.5	8617.5	285.98	2571.5	73.48	42.5	34.5
Primrose ...	1921	4375.0	185.5	5740.5	249.74	1365.5	64.24	31.2	34.5
Anemone ...	1922	5658.0	204.0	7102.0	253.12	1444.0	40.12	25.5	24.0
Zoe	1922	5873.0	196.2	7489.5	233.12	1616.5	36.90	27.5	18.8
Pam	1922	4562.0	164.7	6867.5	228.10	2305.5	63.40	50.5	38.4
Linnet	1924	7350.0	212.0	10,310.5	293.53	2960.5	81.53	40.2	38.4

The interest of these figures lies, of course, in the increase obtained under the Boutflour system; the percentage increase in milk and butter-fat yield is in some cases very striking. The animals concerned are only moderate performers, and the gain would no doubt be emphasised in the case of really high producing cows. The system entails very little extra labour, and this is more than offset by the saving in roughage and succulents, and the large supplies of valuable manure, not to mention the increased quantities of milk, which can thus be made available at a time when they are most valuable.

As regards the cost of feeding, the concentrate ration can be produced for less than ¾d. per lb., silage 8s. or 10s. per ton, veld hay £1 per ton, and legume hays for £2 per ton. Against the cost of the latter should be placed the marked soil improvement due to the growing of leguminous crops, which should reduce the cost to 30s. per ton or less.

Therefore, for an average cow giving four gallons of milk we have:—

14 lbs. concentrates	=	10.5d.
9 lbs. veld hay	=	1.08d.
10 lbs. legume hay	=	1.8d.
33 lbs.		1s. 2d.
		or 3½d. per gallon.

The veld hay can be replaced with 36 lbs. silage, costing 2.16d., but it is interesting to note that as far as could be seen the substitution of silage for hay did not affect the yield. The hay was good green stuff, cut mostly when in flower, and the maize silage was from a crop which, if allowed to mature, would have given at least eight bags to the acre. The addition of pumpkins, etc., also made no apparent difference either to the yield or the health of the cows, unless fed in large quantities, when they caused a decrease in production.

It is, of course, not suggested that the above results are conclusive or final; they are offered in all humility as an attempt to provide a suitable and economical ration for dairy cows from easily grown Rhodesian foodstuffs.

COMMENT BY THE DISTRICT DAIRY OFFICER.

The feeding experiment conducted by Major R. R. Sharp will undoubtedly be of interest to all Rhodesian dairy farmers.

The ration fed to the cows during the experiment is one compounded of foodstuffs which can usually be grown on the average Rhodesian farm. Of particular interest is the use made of the de-seeded sunflower heads. The latter is a feed well liked by stock and may be regarded as a fairly satisfactory substitute for wheat bran in a dairy cow's ration; it is, of course, a very much cheaper concentrate than bran.

Of equal interest is the fact that the substitution of silage for hay in the ration did not affect the milk yield. It cannot be concluded from this, however, that silage is not as indispensable a roughage as we have hitherto been led to believe. The average Rhodesian dairy cow is allowed veld grazing *ad lib.* during the dry season; the grazing at this time of the year is not of the best and is probably consumed in excessive quantities by dairy stock. The passage of this and similar unsatisfactory foodstuffs through the digestive tract of the animal concerned is probably hastened and facilitated by the addition to the ration of silage, sweet potatoes, etc. It is here that these and similar succulent feeds serve a very useful purpose.

The results obtained by Major Sharp, however, undoubtedly indicate that succulent feeds are by no means essential for high milk yields in the case of cows whose roughage and concentrate allowances are controlled.

It would appear, therefore, that in order to obtain the maximum yield of milk and butter fat, dairy cows must be stabled and fed during the dry season. As an alternative to this practice it is suggested that milking cows might be allowed to run in a small paddock practically devoid of grazing during the day. The cows would be stabled at night; roughage grown for the purpose could be fed in a paddock of this kind, and concentrates would be fed in the stable at milking time. Under this system the amount of roughage consumed by individual cows could be more or less controlled.

Notes from the Veterinary Laboratory.

By Ll. E. W. Bevan, M.R.C.V.S., Director of Veterinary Research, Salisbury, Southern Rhodesia.

"It is far too commonly forgotten that science is of assistance to the breeder only if he knows already the primary business of farming. It can be of help only if he is competent to apply its generalisations to his own particular circumstances. Science can contribute nothing unless the breeder is at all times prepared to jettison the old and to accept the new, to regard no method or system as immutable."

Crew.

THE PRACTICAL MAN is often somewhat severe and not always quite fair in his criticism or the so-called "expert," especially if that unfortunate individual happens to be a Government official who is prohibited from defending himself.

What, we may ask, is a "practical man"? In Chambers' Etymological Dictionary we find the definition of the word "practical" is "applying knowledge to some useful end." This implies that the practical man must possess knowledge which he applies in the performance of his vocation. From whence does he acquire this knowledge? Is he born with it? Pasteur once said, "Without theory, practice is but routine born of habit. Theory alone can bring forth the spirit of invention." It is probable that many practical men would make but little progress if they had to rely entirely upon their own observations and inventions. Generations of them observed the steam rising from the pot, the apple falling to the ground, the bird soaring to the sky, before the natural forces which these daily occurrences demonstrated were appreciated and made use of for the service of man.

Strangely enough, the definition of the term "expert" corresponds very closely with that of "practical." The word is derived from the past participle of the Latin verb "experiri," to try thoroughly. It is explained by the dictionary as "taught by use, practice or experience; having a facility from practice." And an expert is said to be a "skilful or practical person; a specialist." It is in the last word that the distinction lies. The so-called "expert" has as a rule specialised, while the "practical man" as a rule has a profound knowledge of every subject—or thinks he has.

The term "expert" in the sense that it indicates practice and experience is often misapplied. The latest student from college may pose as an expert, although he has had little time or opportunity to practise the knowledge he has so recently acquired. As he grows older he realises his limitations.

Another term which is often misunderstood is "scientist," a word which is defined as a "person versed in or devoted to science." The word "science" is derived from the Latin "scientia," knowledge, and is explained by the dictionary as "comprehension or understanding of the truths or facts on any subject or department of enquiry; certain knowledge; truth ascertained by observation, experiment and induction; the whole body of truths or facts known under classes or heads; induction of general laws or principles from particular truths or facts; statement or embodiment of the laws or principles from particular truths or facts; theoretical knowledge, as distinguished from practical; knowledge of the principles and rules of invention, construction, mechanism, etc., as distinguished from art; any art or species of knowledge, as opposed to literature, etc." This very comprehensive definition indicates the unwisdom of posing as a "scientist." This is particularly so in the case of an official whose multifarious duties prevent him from engaging in pure science. All that he can hope to do is to acquire such scientific knowledge as he can within the limits of his time, facilities and ability, and retail it in such a way that it can be made use of by the practical man to general advantage.

Thus any unfair criticism by practical men of the so-called "scientists" and "experts" of the Agricultural Department is to be deplored. These notes have always endeavoured to bring them together, because it has been

realised how dependent the one is upon the other. This is particularly the case in veterinary matters. The practical man should not hesitate to make use of, let us say, the quarter-evil vaccine, the method of inoculating horses and mules against horse-sickness, systematic dipping, trypan blue in the treatment of biliary fever and redwater, the "wire-worm remedy," the injection for the treatment of "fly-struck" cattle, the inoculation of imported bulls, diagnosis based upon the microscopic examination of blood smears and other preparations, and a dozen and one other benefits resulting from the discoveries and inventions of the much maligned expert or scientist.

Reports.—The 15th annual report of the Director of Veterinary Services of the Union of South Africa, for the year 1929, has now been published and can be obtained from the Government Printer, Pretoria, for the sum of ten shillings. This valuable report, issued in two volumes of over 500 pages each, provides much food if little time for thought. It would be impossible in these notes to deal adequately with it, but some of the results obtained may be referred to and applied to Rhodesian conditions.

Protozoal Diseases.—Under this heading the Director, Professor P. J. du Toit, deals with the diagnosis of *T. vivax*. This is a subject of some practical importance in this Colony, because this particular parasite, transmitted by the tsetse fly, has recently been found to be far more prevalent here than was hitherto suspected. It is also one which presents some difficulties and complications to those investigating it. This trypanosome is never present in large numbers in the peripheral blood (a fact which was referred to in the last annual report from the Salisbury Laboratory) and is therefore difficult to detect. Dr. du Toit states that the examination of gland smears is valuable in diagnosis, the chances of detecting the parasite in them being as 12 to 1 as compared with blood smears. This has not been our experience. But *T. vivax* is a parasite which apparently presents different characteristics in different circumstances. For example, Richardson in Uganda refers to it as "swarming" in the peripheral blood; whereas in Southern Rhodesia a daily search of blood smears only occasionally reveals parasites and then only very few in number. This is a matter

which would appear to be of purely theoretical interest, but as a matter of fact it is of considerable practical importance because it has a bearing upon the success of the local method of treatment.

The next article, by Dr. G. de Kock, deals with the relation of the spleen to immunity in bovine piroplasmosis or redwater, and the following conclusion, among others, is of importance. "Locally-bred animals immunise naturally more easily than imported stock. This is probably due to some inherited resistance." This has been our experience in Rhodesia, and the work of preparing and testing a suitable redwater and gallsickness vaccine for the protection of imported or even locally bred cattle has been seriously handicapped by the absence of suitable animals for the work. It is satisfactory, therefore, to find our local observation confirmed by workers elsewhere, because, unfortunately, "a prophet is not without honour but in his own country," and sometimes most unpleasant interpretations are placed upon the failure of local efforts.

There is another important feature in connection with the inoculation of cattle against redwater, namely, that the strain of redwater parasite of one district varies from that obtaining in another, and immunity against one may not protect completely against the other. For example, it was found, as long ago as 1911, that an animal inoculated with Onderstepoort vaccine was not necessarily resistant to natural, *i.e.*, tick-borne infection, in Southern Rhodesia. A recent article appearing in "Farming in South Africa," April, 1930, on "Redwater and Gallsickness—Inoculation of Cattle," is therefore of considerable interest. It says:—

"It occasionally happens that farmers complain to the Division of Veterinary Services and Animal Industry that, although a particular animal had been injected previously with the vaccine, it subsequently had an attack of redwater to which it succumbed. On the face of such a complaint it would appear that the vaccine was entirely at fault in that it failed to produce an adequate protective immunity, but an enquiry into the circumstances of the case will usually indicate that this is not so.

If the vaccine is injected strictly in accordance with the instructions covering the issue, it can be relied upon to

produce a mild, often unnoticed, attack of redwater and a slightly more severe, though nevertheless non-fatal attack of gallsickness. Having passed through the artificial attacks of the two diseases, the animal becomes immune to or salted against either disease in its natural form.

In the case of gallsickness the degree of immunity is high, and though the salted beast may be exposed subsequently to heavy tick infestation, an attack of gallsickness may not be feared, since, should a relapse occur, it will be of so mild a nature that either it will be noticed by only an exceedingly careful observer, or alternately will cause only a few days' insignificant indisposition. In the case of redwater, however, the above does not always hold good. Unfortunately there are numerous strains of the one blood parasite which cause the trouble, and careful experimentation has shown that immunity produced against one or more strains does not always protect against all other strains. For this reason, even though an animal had shown a perfectly normal reaction to the vaccine on or about the tenth day after injection, it is of the greatest importance to exercise every care when such an animal is exposed to tick infection on the veld or alternately is moved to a different locality. In either of these two events there is a real danger of the ticks transmitting a strain of the redwater parasite which will overcome the immunity conferred by the vaccine. The result will be an attack of redwater appreciably milder than that which would occur under similar conditions in an unvaccinated animal, but still in many instances fatal. For this reason it is always essential to keep a watchful eye for several months on animals which are turned out after completing the immunisation process. If during that time any departure from normal health is observed, take the temperature, and if it is above normal, namely 103° in the morning or 104° in the afternoon, suitable precautionary measures should be adopted without loss of time. Place the animal in quiet, comfortable surroundings, *e.g.*, a well ventilated stable or a shady small camp, feed on light nutritious laxative food and inject 100-200 c.c.'s of a 1 per cent. solution of trypan blue solution. This trypan blue is supplied with the vaccine, with full particulars for use; it is an absolutely harmless drug, which cannot possibly do any harm

if the directions are observed and will be effective immediately in stopping the development of redwater.

The whole point is that farmers must not be lulled into any feeling of false security after using the redwater and gallsickness vaccine. The immunity against gallsickness is, fortunately, solid; fortunately, because we know of no drug which can be relied upon to have any certain beneficial effect on the progress of the disease. The immunity against redwater may in some cases prove to be inadequate, but this need cause no alarm, since in trypan blue we have a drug which is safe to use and perfectly reliable, and its timely injection will be immediately effective in every case. In other words, the farmer can rely upon the inoculated animals being salted against gallsickness, for which there is no specific remedy, but by careful observation and intelligent application of his knowledge he must be prepared to assist the vaccine against the redwater by the judicious use of trypan blue."

The experience, extending over a period of eighteen years, with our own method of inoculation, was that it conferred immunity against natural infection in most parts of Southern Rhodesia, but within the last few years redwater or gallsickness has occurred in inoculated cattle on three ranches. The reason cannot be satisfactorily explained. It may be that a "foreign" virus, that is to say, a virus differing from the local strain, has been introduced to these places in cattle which have been imported from the south for the improvement of the local stock.

An article by Sir Arnold Theiler and Professor du Toit on the "Transmission of East Coast Fever by Means of Blood" is of great interest, having a bearing upon the immunisation of cattle against this disease. Hitherto, attempts to transmit the infection by blood inoculation have rarely been successful, in which respect, of course, the disease differs from redwater and gallsickness. The report refers to the inoculation of cattle in various ways, which may be tabulated as follows:—

Injection of virulent blood.	No. of cattle.	Results.
1. Into the jugular vein	6	6 negative.
2. Under the skin	7	1 positive, 6 negative.
3. Into the skin	9	1 positive, 8 negative.
4. Into the peritoneal cavity	4	1 positive, 1(?2) negative
5. Under and into the skin	10	7 positive, 2(?1) negative
6. Under and into the skin and into the glands	4	4 negative.
7. Under and into the skin, into the peritoneal cavity and into the glands	4	4 negative.
8. Injection under the skin and rubbing blood into the scarified skin	2	2 negative.
9. Rubbing infected spleen and gland pulp (and blood) into the scarified skin	3	3 negative.
	49	12 positive, 36 negative.

The method of inoculation which gave the best results was the injection of blood under the skin and into the skin, which yielded 70 per cent. successes. Something may come of this; but bound up with the problem are the questions as to the duration of immunity conferred as the result of recovery and the possibility of a recovered animal remaining a source of danger.

The subject of "Dipping as a Method of Eradicating East Coast Fever" is dealt with by Professors du Toit and Viljoen, and their summary and conclusions may be reproduced verbatim.

"1. Short-interval dipping with hand-dressing has been shown not to be effective in checking an outbreak of East Coast Fever on an already badly infected farm. Cases of the disease will occur so long as there are infected ticks on

the farm and the cattle are exposed to infection by such ticks.

2. There appears to be very little difference in the effects of three- and five-day-interval dipping and hand-dressing.

3. The value of dipping in plain arsenite of soda, three-day strength (0.08 per cent. As_2O_3), is not materially enhanced by adding to this fluid soap and paraffin. (Pitchford's formula.)

4. Hand-dressing of the ears and tails appears to be a necessary adjunct to dipping for the destruction of all ticks on animals. Of the preparations tried, a tobacco and oil mixture has given the best results.

5. The clipping of hairs from the ears and brush of the tail seems to assist dipping and hand-dressing in the destruction of ticks.

6. Cattle which have been dipped regularly for a considerable time seem to contract East Coat Fever as readily as those only recently dipped for the first time. This result speaks against the idea that there is an appreciable accumulation of arsenic in the skin of dipped animals.

7. On many infected farms where short-interval dipping is carried out, further infection of ticks takes place, this being due mostly to the many practical difficulties in the way of carrying out the system in a perfect manner. Among these difficulties may be mentioned unfavourable climatic conditions, poor grazing, lack of fencing and proper control of the animals.

8. In the destruction of ticks and the eradication of tick-borne diseases dipping has been of inestimable value; it has rendered many parts of the Union fit for cattle and sheep farming.

9. For the eradication of East Coast Fever dipping is a slow process which has many disadvantages. With the present very limited distribution of the disease in the Union it would pay the State much better to adopt other measures (*e.g.*, slaughtering or removal of cattle), especially in isolated outbreaks."

These deductions, in many respects, appear to be contrary to practical experience in this Colony.

Virus Diseases.—"The Nature and Duration of the Immunity against Blue Tongue in Sheep" is reviewed by Dr. du Toit. His conclusions are of great interest, particularly to the laboratory worker interested in what are known as "virus diseases," a class to which horse-sickness, rinderpest, foot and mouth disease, canine distemper, human measles, small-pox and perhaps even cancer and the common cold may belong. The nature of these so-called "viruses" is still a question which is exercising the minds of scientific workers, not only in connection with human and animal, but also plant diseases. An interesting observation recorded is that "vaccine which had been kept for 18½ years at ordinary room temperature was found to be active. It produced temperature reactions in the majority of sheep, although the immunity conferred by it seemed to be weak." A somewhat similar example of the longevity of a virus was recently demonstrated at this laboratory, horse-sickness virus collected in 1915 proving deadly in 1929. These so-called virus diseases present many mysteries. The actual nature of a virus is unknown. It is "only known by its effects; it is exceedingly potent in producing disease and yet is so small that it passes through the pores of unglazed porcelain; its dimensions may be compared with those of a sphere of 0.00025 m.m. diameter. It possesses great power of multiplication. A small drop of fluid from a dog with distemper may be diluted ten million times, and yet when a drop of this is injected into another dog the virus may multiply to such an extent that in three days it has invaded every tissue; and if the rest of the dog could be removed, leaving the virus, the latter would form a good model of the dog. These viruses possess individuality and are not interchangeable." (*Nature*, 15th March, 1930.) And yet on more than one occasion official research officers have been called upon to express them in formula or to set down as a prescription a method of immunising against them.

Bacterial Diseases.—The next section of the Report relates to various bacterial diseases, and Dr. Robinson deals exhaustively with "Botulism" in domesticated animals and a form of icterus of sheep produced by inoculation with the

bacillus of Preisz Nocard. It will be interesting to ascertain whether similar conditions occur in this Colony. Dr. Neser describes a method of preparing contagious abortion vaccine on solid media:—"Before issuing vaccine we warn owners about the danger in connection with its use, and whenever possible we first of all make quite certain that it is contagious abortion by applying the agglutination test. Certain users assure us that the vaccine, while giving a good immunity, never brings about abortion, even if injected into pregnant animals. While this statement cannot be accepted as literally correct, there is no doubt that the vaccine strain is very much attenuated, because we never now find any lesions in the test guinea-pigs."

It may be explained that there are two sorts of contagious abortion vaccine, namely, the so-called "live vaccine" and the "dead vaccine." The first is made up of live and presumably virulent organisms and can only be inoculated into non-pregnant animals for fear of producing abortion and setting up foci of infection. For these and other reasons its use is now generally condemned. The "dead vaccine," on the other hand, contains organisms which have been destroyed and their virulence eliminated by cooking or by chemical processes. Such vaccines are said to be useless. The advocates of the "live vaccine" have been somewhat embarrassed by the criticisms concerning the use of it, but have hit upon a compromise by producing a vaccine made up of "live" organisms which have been so profoundly attenuated that they are no longer virulent. Whether they are still capable of giving rise to immunity and whether they may not recover their virulence in the living animal remain to be proved.

Articles on anthrax immunity are contributed by Veterinary Research Officers Quinn and Bekker, and another on "Immunisation against Anærobes of the Gas-Gangrene Type in South Africa by Means of 'Anatoxins.'" The use of formalin in modifying toxins for the production of antitoxins was, we are told, noticed by Glenning and Hopkins in 1904 and was made use of by them in immunising horses for the production of diphtheria antitoxin on a large scale. Special attention was drawn to it by Ramon in 1924, and since then formaldehyde has been very generally used in the

preparation of black-quarter and other vaccines. More recently it has been employed in the preparation of the canine distemper prophylactic vaccine. Canine distemper being a virus disease, the application of the process to other diseases of the same class naturally followed, and Whitworth in Kenya has recently reported very successful experiments in connection with a method of inoculation against horse-sickness based upon the same principle. It is unfortunate that it wás not discovered earlier. Since 1921 chloroform rather than formalin has been largely used at the Veterinary Research Laboratory, Salisbury, in the preparation of the "devitalised" contagious abortion, quarter-evil and other vaccines.

"A more refined method of bleeding birds to obtain serum for the agglutination test for Bacillary White Diarrhœa" is described by Research Officer Alexander. This is a disease of young chicks, conveyed to them through the eggs of chronically infected hens which are "carriers" and can only be detected by a blood test. The method of applying the test described is a great advance on older methods, and resembles in some respects that advocated by the writer in the *Rhodesia Agricultural Journal*, 1915, for the collection of blood from cattle for the detection of contagious abortion. His "abortoscope" method has also been made use of in testing chickens for bacillary white diarrhœa and has proved very simple and accurate, the owner himself being able to carry out the test. As far as we know, this disease has not yet appeared in chickens in Southern Rhodesia, but in view of the growing importance of the poultry industry in this Colony it behoves us to be on our guard.

"Diseases of Domesticated Animals of South Africa due to Organisms of the Salmonella Group" are described by Veterinary Research Officer Martinaglia. One of these is the so-called "calf paratyphoid," a disease of calves whose vitality has been lowered by improper feeding, bad hygienic conditions which predispose to digestive disturbance, red-water and gallsickness, coccidiosis, sweating-sickness, heart-water, etc. The writer of the article says, "Apart from anti-paratyphoid vaccination, preventive measures against this calf mortality consist in practising sound methods of

animal husbandry and adopting general hygienic principles. Among the latter must be mentioned tick eradication by regular short-interval dipping, continued over a long period." This has been the common experience in Southern Rhodesia. In the pre-dipping days the mortality among calves was enormous, and many of them suffered from what would now appear to have been paratyphoid infection. With systematic dipping most of these diseases disappeared.

The so-called "bacillary white diarrhœa" of chickens, previously referred to, is one of the diseases due to a bacillus of the Salmonella group, as also is fowl typhoid, of which the writer says, "To-day it may be assumed, from experience gained during the last five years, that fowl typhoid is the commonest and most destructive bacterial disease of poultry in the Union."

Parasitology.—Articles are contributed by Veterinary Research Officer Monnig on "The Guinea Worm of the Ostrich," "A Hookworm of the Kangaroo," "A Hookworm of the Springbuck," and Veterinary Research Officer le Roux deals with certain parasites of the camel in the Cape Province, antelopes in South Africa, the spring hare and the blue wildebeest. He also contributes "Notes on the Life Cycle of the Schistosoma Mattheei," a parasite which has recently been met with by Veterinary Research Officer Lawrence, at this Laboratory, in sheep in Southern Rhodesia. This parasite is of considerable interest and importance. It inhabits the tributaries of the portal vein, but in adverse conditions migrates to other localities, causing lesions in the lungs, liver, walls of the small and large intestines, lymphatic glands and pancreas. Its eggs have a characteristic spine, which may be responsible for some of the lesions met with. These eggs are passed in the dung, and their presence can be detected by microscopic examination of fæces collected and forwarded to the laboratory in the manner described in previous "Notes." This highly technical article contains a very practical observation and one which confirms the views we have frequently expressed in these "Notes" and elsewhere. Le Roux states, "In South Africa the losses from the majority of gastro-intestinal parasites of sheep and cattle are seasonal and are most severe in a given locality, when the natural grazing in that locality is at its worst. The

rapid disappearance of œsophagostomiasis this spring from the flocks of the western Transvaal and Bechuanaland at the appearance of green pastures after the first rains proves to my mind that 'the withdrawal of material essential to the host's economy' is a most important factor to be considered in the fight against parasitic diseases." Experiments "seem to indicate that animals in good condition possess the power of protecting themselves against certain helminths, and that infected animals, when properly cared for, can rid themselves of these worms."

The first volume of the Report terminates with an exhaustive article by Mr. Bedford on "The Effects upon Ticks of Dipping Cattle regularly at Short Intervals in Arsenical Baths." His summary and conclusions occupy three pages and space does not permit of their reproduction here in detail. Suffice it to say that they largely confirm the advice which has been consistently given by the Veterinary Department to stock-owners in Southern Rhodesia. The second volume of the Report must be dealt with in a future issue of the Journal.

SHOW DATES.

Umtali: 18th and 19th July.
Bindura: 26th July.
Gatooma: 1st and 2nd August.
Rusape: 8th and 9th August.
Fort Victoria: 15th and 16th August.
Salisbury: 20th and 21st August.
Gwelo: 28th and 29th August.
Bulawayo: 3rd and 4th September.

Agricultural Experiment Station, Salisbury.

ANNUAL REPORT OF EXPERIMENTS, SEASON 1928-29.

(Concluded.)

By H. C. Arnold, Manager.

(Published with the Authority of the Chief Agriculturist.)

PART III.

LINSEED OR FLAX.

Although not of great importance as a crop in this Colony, linseed or flax is grown by a few farmers for the seed, for which there is a small local demand. The much heavier yields of seed recorded this year are mainly due to the linseed having been grown on more fertile soil than in previous years, and this serves to show the manner in which the crop responds to good soil and good treatment.

LINSEED VARIETY TRIALS.

Yields in lbs. per Acre.

Name of Variety.	1928-29	1927-28.		Average over 4 Seasons.	5 Seasons.
	Seed.	Straw.	Seed.	Straw.	Seed.
Large seeded	770	560	304	956	398
White flowering ...	760	850	296	1079	438
Small seeded	...	640	260	855	361
Yellow seeded ...	495	800	272	1018	381 (3 Seasons)
Saginaw	720	1080	240	1445	519
Pskoff	...	1050	200	1378	440
J.W.S.	465	1900	150	1882	255

Several varieties have been under trial here for the last eighteen years, and hitherto that known as "white flowering" has proved the most consistent seed yielder. But during the last two or three seasons the "large seeded" kind has improved in this respect. The large size of the seed of this latter variety makes it more attractive than the smaller seeded kinds to the buyer of seed for feeding purposes, but this same size causes double the weight of seed per acre to be required for sowing.

The Saginaw variety was introduced from Canada, where it has been developed as a dual purpose strain for flax and seed. The J.W.S. flax is a strain supplied to this Department by the Irish Linen Research Station, Lambeg, Belfast. As will be noted, it gives the highest yield of straw of any of the varieties under trial, but a very low yield of seed. It is unsuitable for local conditions until such time as a flax-fibre industry may be developed, and investigations in this direction have not yet led the Department to feel justified in recommending the growing of J.W.S. flax in Southern Rhodesia either for fibre or for the export of seed of this particular strain—one of the possibilities in view when the introduction was first made.

BEAN VARIETY TRIALS.

Dolichos (*Bonavist or Hyacinth Bean*).—During the past few years this bean has rapidly gained popularity amongst those who require a soil-improving crop suitable either for hay, silage or green manuring. To a large extent it appears to have displaced the velvet bean as a fodder and green manure crop, the reasons for this being the fact that its hay is less fibrous and more palatable, its yields are heavier, and it is less susceptible to attack of bacterial leaf blight, which often considerably reduces the yield of the velvet bean crop.

Until the last season or two, dolichos beans have escaped attack by the bean stem-maggot, which often so severely attacks cowpeas. During 1929-30, however, several cases have been noticed where the growth of dolichos beans has been seriously checked by this pest, and the possibility of increased injury from this cause in future years must not be lost sight of.

Since the commencement of our trials some fifteen years ago, upwards of twenty different strains have been tested, but so far none has proved itself better adapted to local conditions than the small brown seeded variety, which was the first one introduced. The white seeded kinds often yield rather larger quantities of fodder than this brown variety, but their yield of seed is usually very low, and for that reason their cultivation on a field scale cannot be recommended.

Variety Trials.—The number of varieties under trial this season was considerably reduced, only those which had given outstanding results in previous trials being included. The variety known as "Macs" bean was again grown because it had been comparatively recently introduced, but it failed to produce seed in spite of a luxuriant growth of vines and an abundance of flowers.

DOLICHOS BEAN VARIETY TRIALS.

Yields in lbs. per Acre.

Name of Variety.	Green Fodder.		Hay.		Seed.	
	Season 1928-29	Average 1924-29	Season 1928-29	Average 1924-29	Season 1928-29	Average 1924-29
Small brown seeded	21,762	18,428	3672	4563	1260	562
Indian	18,846	17,320	3996	4945	270	247
Ewanrigg (3 seasons)	24,300	21,466	4806	5540	310	169
Macs brown ...	18,630	16,890	4104	2648	nil	4

These returns show that the small brown seeded bean (the common variety) has given considerably heavier yields of seed than the others, and that this superiority in yield is being well maintained.

Velvet Beans.—Before the introduction of dolichos beans and Sunn hemp, the velvet bean was the most popular leguminous fodder and green manure crop grown in this Colony, but its thick, fleshy pods and considerably lighter yield of vines make this bean less suitable for conversion into

hay than the dolichos bean. The upright habit, quick growth and general adaptability of Sunn hemp have now rendered this the most popular crop for green manuring.

The White Stingless velvet bean has hitherto claimed premier honours over numerous other varieties which have been tested here, but another strain, received through the courtesy of Mr. A. W. Laurie, of Concession, has given heavier yields during the past two seasons. The new variety has been named "Somerset," after Mr. Laurie's farm, and those farmers who still favour the velvet bean would probably profit by giving this variety a trial.

A number of strains which have not proved equal to the common White Stingless have been eliminated from our tests, which now include only three types.

VELVET BEAN VARIETY TRIALS.

Yields in lbs. per Acre.

Name of Variety.	Green Fodder.		Hay.		Seed.	
	1928-29	Average 1927-29	1928-29	Average 1927-29	1928-29	Average 1927-29
White stingless	18,116	14,308	3603	3302	1970	1585
Somerset ...	23,274	25,497	4655	4793	2560	2690
Variety 30/26	22,032	21,816	4406	4219	2055	1958

From this table it will be seen that both the new varieties have given considerably heavier yields during the past two seasons than the White Stingless. Osceola and Tracey's Early Black produce seed in greater quantities, but their low yield of vines makes them less suitable for hay or green manuring. In view of its heavy yields, both of vines and seed, the Somerset may well prove the most useful strain yet introduced.

Soya Beans.—All the standard leguminous hay crops at present grown in this Colony have trailing vines, which by becoming intertwined, prevent the free passage of machinery used during haymaking or harvesting operations. With the increasing use of machinery in field work, a demand for

legume crops which can be reaped by mechanical devices is inevitable, and for this reason the soya bean crop, which can be handled by these means, would be much more generally useful than either the velvet or dolichos bean. Although soya beans are used for many different purposes in other countries, the seed yields obtained here so far are not high enough to justify its cultivation as a grain for export, but the Oo-too-tan variety has given fairly heavy yields of fodder which at this centre place it in front of all other upright-growing, leguminous hay crops.

For the present it is thought that the crop can be utilised to the best advantage in the form of hay or silage, but the oil contained in the seed and the valuable concentrated stock feed left after the oil is extracted suggest other ways in which soya beans may be utilised locally in the not distant future.

Many varieties of this bean have been obtained from numerous sources and have been tested over a number of years, but so far that named Oo-too-tan has proved itself the heaviest producer of both fodder and seed. Our records show that this variety yields rather less hay than the dolichos bean, but that it compares favourably with the hay yields of velvet beans. The black seed of the Oo-too-tan might not be favoured by the oil trade, which gives preference to yellow seeds, but its value as a hay or silage crop is not diminished by the colour of the seed.

A serious drawback to the soya bean is its habit of uneven ripening and of shedding seed within a few days of reaching maturity, thus making it necessary to harvest the crop immediately, to avoid losing a considerable portion of the beans. Late maturing varieties are found to yield the heaviest crops, and when these are planted during December better returns are reaped than when planting is delayed to a later date. Less trouble from shattering of the seed is also experienced from the early plantings, since these ripen when moisture is still present in the soil and atmosphere, and the ripening pods do not therefore dry out so quickly.

SOYA BEAN VARIETIES.

Yields in lbs. per Acre.

Name of Variety.	1928-29		1927-28		Average over 2 Seasons.	
	Hay.	Seed.	Hay.	Seed.	Hay.	Seed.
Oo-too-tan	4608	1309	2080	680	3344	995
Haberlandt	2250	858	1640	620	1945	739
Biloxi	3510	552	3160	160	3335	355
Herman	4459	1210	1526	574	2992	892
Chiquita	2730	968	1088	254	1909	611
Dixie	2639	955	1022	224	1803	589
Chinese White	4580	1188	...	...	...	...
Southern	4410	506	...	...	...	...

The nitrogen-gathering bacteria present in the nodules on the roots of many leguminous plants are of a different strain to those associated with the soya bean. For this reason the crop is often a complete or partial failure when it is grown in a new locality for the first time or on land which has never grown soya beans before.

A bacterial culture for inoculating soya beans was used on a small plot under irrigation, and the luxuriant vegetative growth and numerous nodules formed on the roots of the plants grown on the treated plots, as compared with those on untreated soil, indicate that the inoculation had beneficial effects. Soil from this inoculated plot will be applied to a larger area under soya beans next season in order to test further the effect of inoculation, and it may be that by this means better fodder and seed yields will be obtained than has been the case in the past.

EDIBLE CANNA.

This comparatively new introduction is rapidly gaining favour, its chief value lying in the succulent roots and tops, which are of great value for winter feed. If reasonable treatment is given, succulent feed may be obtained from a

patch of canna at any time of the year, but if maximum production of tubers is looked for, the top growth should not be cut until the plants are fully grown and the leaves are drying off. In the few instances in which farmers have expressed disappointment at the smallness of the crop of tubers, it has been found that the whole of the top growth had been removed two or three times during the growing season. It should be remembered that the green stalks and leaves which arise from the mature tubers are necessary for the production of new tubers, unless the new growth is to be made at the expense of the parent tuber. For this reason, if the top growth is removed prematurely the normal production of new tubers will be hampered. Further, if the tops are removed repeatedly during the growing season, there is danger of destroying the entire plant.

Since the canna and sweet potato crops are both used for similar purposes, the question as to which is the better of the two is often asked. Previous experiments conducted at this station had indicated that there was little difference in their relative cropping powers, but during the past two seasons the early butter sweet potato has yielded considerably heavier crops of both tops and tubers.

CANNA *VERSUS* SWEET POTATO TRIALS.

Yields in lbs. per Acre.

Season.	Number of Plots.	Canna.		Sweet Potato.	
		Tops.	Tubers.	Tops.	Tubers.
1927-28	12	10,208	13,284	15,336	20,088
1928-29	6	14,958	16,443	17,262	24,066

In the experiments in which the above data were obtained, both crops were planted in November and the tubers were lifted during the following winter months. Part of the canna plots in this year's experiments have been allowed to remain in the ground undisturbed, with a view to ascertaining how the crops compare when they are allowed to occupy the ground for two successive seasons. In this experiment the sweet potato tubers and tops and the canna tops will be

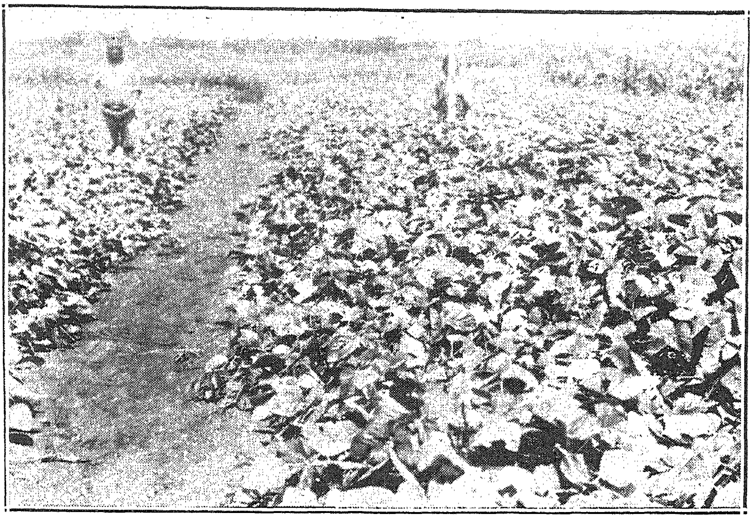


Plate VI.

Somerset velvet bean (right). Compare with White Stingless variety on left. Agricultural Experiment Station, Salisbury.

Plate VII.

White Dutch clover, established five years previously on red soil under irrigation. Photograph taken 17th September, 1929. Agricultural Experiment Station, Salisbury.

Plate VIII.

Strawberry clover on left; Alsike clover on right. Both growing in tins in which the soil is maintained in a waterlogged condition. Agricultural Experiment Station, Salisbury.

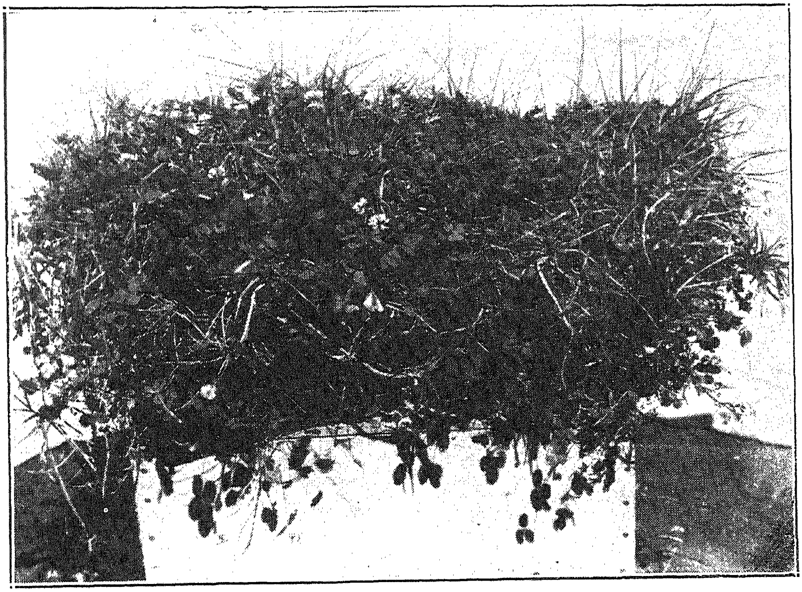


Plate IX.

Clover and Kikuyu grass. During the cooler part of the year the clover

removed each year, but the canna tubers will not be lifted until the end of the second season.

EDIBLE CANNA: DISTANCE PLANTING TRIALS.

Yields in lbs per Acre. First Season's Crop.

Distance of Planting.	No. of Roots required per Acre.	Season 1928-29		Season 1926-27.		Average of 2 Experiments.	
		Green Tops, cut June 1929.	Tubers.	Green Tops, cut May 1927.	Tubers.	Green Tops.	Tubers.
40″ x 24″	6534	10,692	19,480	16,500	11,160	13,596	15,320
40″ x 36″	4356	10,516	17,726	18,274	11,472	14,395	14,599
40″ x 48″	3267	10,980	17,469	16,008	9648	13,494	13,558

Though slightly heavier yields of tubers were obtained on the plots which were planted at 24 inches apart in the rows, it must be remembered that from 1,000 lbs. to 2,000 lbs. per acre more seed is required to plant at 24 inches apart than at 48 inches apart. It is seen, therefore, that the increase obtained on the closely planted plots was no larger than the extra amount of seed required for planting. There appears, therefore, to be no advantage in close planting, approximately 3 ft. x 3 ft. to 3½ ft. x 3½ ft. being probably the most economical distances under field conditions.

KUDZU VINE.

The vigour of the plot laid down here in 1918 has been well maintained, though during the season under review the yield of fodder was not quite as high as that of some of the previous seasons. A cutting taken on 15th February amounted to 6.12 tons per acre of green fodder, bringing the total yield for the period 1920-1929 to 78.22 tons per acre. In 1925 a phosphatic fertiliser dressing of 200 lbs. per acre was applied to this plot, but at no other time has manure or fertiliser of any kind been used.

Of the numerous perennial legumes which have been introduced and tested at this station, kudzu, on dry, upland soils, has given the most promising results, and farmers who

have use for a high class fodder for grazing, hay or for mixing with maize for silage would be well advised to give it careful trial. The fact that the crop requires about three years to become fully productive may deter some farmers from attempting to establish it, but in spite of this drawback it is believed that the initial outlay and trouble will be well repaid by the heavy yields to be obtained for a number of years at little further expense.

CLOVERS.

The highly nutritious character of clover pasture is well known to the majority of Rhodesian farmers, and many would gladly establish these legumes on their farms if they thought the outlay would be justified.

Several species of clover have been tried at this station since its inception, but hitherto none has been found which is suitable for summer cultivation under the usual dry-land conditions, though some varieties have given encouraging results under irrigation. The behaviour of the more promising species under cultivation engendered the belief that they might successfully be established on many of the wet vleis which are found on the sand veld areas. The perennial varieties of clover demand a comparatively moist soil throughout the whole year. Their root systems do not penetrate far below the surface and they are not suited to situations which become thoroughly dry for periods of more than a few weeks.

Annual clovers may be found suitable for land which does not allow of the cultivation of the perennial species by reason of their ability to reach maturity before the plant is killed through lack of moisture in winter. Of these latter, "subterranean" clover is likely to prove one of the best, because of its habit of burying its seed in the soil, where it remains intact until the return of weather conditions suitable for germination.

Clovers do not thrive on acid soils nor on those which are lacking in phosphates, and if any deficiency of these is suspected they should be supplied before the clover seed is sown. A most desirable feature of the perennial clovers is the continuity of their growth, which extends throughout the entire year. This trait is specially noticeable during the winter and early spring months, when the growth of the

natural herbage is arrested by low temperatures. The frosty nights which are experienced here during the winter months somewhat retard the rate of development of the clovers, but in spite of this, considerable growth is made even during the coldest months, and it is much accelerated as soon as warmer weather sets in. Early in the season a quantity of seed is produced, which is capable of re-establishing the stand should the parent plants succumb later through adverse conditions.

The inability of the perennial clovers to survive on really dry soil for more than a few weeks limits the areas on which they can be grown to irrigated land and vleis which retain a certain amount of moisture throughout the dry season. Vleis which are moist in September and October are—in most cases—water-logged during several months of the rains, and in order to ascertain whether clover would be likely to survive under such conditions, three or four of the more promising varieties have been grown for three years in tins in which the water level is constantly maintained during the summer months at a level of one to two inches above the surface of the soil. Under these conditions Alsike, White Dutch and Strawberry clover have persisted and made very satisfactory growth, and the experiment seems to indicate that these varieties will survive for several months at a time in soils which for that period are completely water-logged. Although the conditions under which these experiments have been made are highly artificial, they nevertheless indicate the possibility of establishing clover pastures in favourable situations in this Colony. The moisture-retaining character of the soil appears to be the limiting factor, for the necessary lime and phosphates can be supplied artificially as required.

Irrigated plots of clovers at this station have been attacked by "mealy bug" during the summer months, which, together with the black ants which attend the bug, have inflicted considerable damage on the older beds. It is probable, however, that this pest would be unable to survive on land, such as vlei soils, which was annually subjected to periodical floodings of some duration and which in addition was heavily grazed. This fact may provide another reason for the clovers being most likely to thrive best on land which is water-logged during part of the year. Further investigation is needed, however, before sowings of these clovers on anything more than a strictly experimental scale can be recommended.

Tobacco Production in America and Southern Rhodesia.

SOME COMPARISONS.

By W. Collingwood Evans, B.Sc.(Agr.),
Assistant Tobacco Adviser.

This article has not been written with any specific object in mind, that is, it is not intended that Rhodesian farmers should make the information contained herein a basis on which to run their own farms. The writer fully realises that economic and climatic conditions must necessarily affect production methods and costs to a large extent. On the other hand, America, with an average annual production of between 1,000,000,000 and 1,500,000,000 lbs. of tobacco, undoubtedly sets the world's price for that commodity. It is, therefore, perhaps wise to pay some heed to their methods. While taken as a whole these methods may be uneconomical and impracticable in this Colony, yet there may be cases where some of the American ideas could profitably be incorporated in our own system.

It may be stated at the outset that this is not a technical study of production costs, neither is it a study of soil or pathological problems. Conditions vary so vastly that only through individual experimentation can we arrive at any sound conclusion regarding these points. What follows forms the combined observations made by the writer while actually working on various farms in Carolina and Virginia.

There is no doubting the fact that American tobacco is better than ours. Having acknowledged this, we ask why it is better. Climatic and soil conditions undoubtedly have some influence. The experience of several hundred years must also count for a great deal. To my mind, however,

the personal equation exercises more influence on the final product than do all the other factors put together.

It must be fully realised that the American farmer is of a different type to farmers in this Colony. His horizon is very restricted. Outside of his farm, his family and the country church, he has very few interests. Broadly speaking, one would say that the average Southern farmer was rather ignorant, being so sadly lacking in general knowledge. Speak to him on any matter pertaining to agriculture, however, and he will be found to be exceptionally well posted, whether the specific phase be legislation, soils, pathology or fertiliser formulæ. He knows every inch of his farm, and knows what his soil will do. His standard of living being low, his expenses from a social viewpoint are negligible.

Personal attention to the crop is, in the writer's opinion, the outstanding fact which accounts for the superior leaf grown in America. The average size of a farm in the Virginia old belt is from 125 to 150 acres. Of this, eight acres is devoted to tobacco, and from 20 to 40 acres to other crops. The remainder of the farm is taken up by woods. The capital invested in one of these farms is comparatively small. Eight thousand dollars or £1,600 would be a fair average. This, of course, includes everything—live stock, machinery and all other farm appurtenances. These figures, it must be understood, are not specific, but form the average of this section. Carolina may be included in this, for the figures for the two States are almost identical.

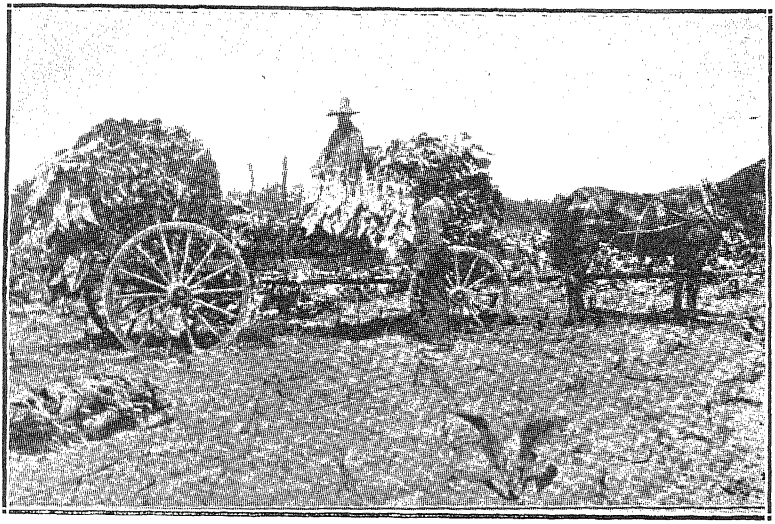
The cost of production per lb. is usually stated as being 20 cents or 10d. This is for flue-cured. For dark fired tobacco 15 cents or 7½d. per lb. is usually accepted as the average cost of production. This fall in production costs in the dark tobacco is due to the fact that less man power is needed, and also because the fertiliser application is not as heavy as in the case of flue-cured tobacco. That is, barnyard manure is used more freely to supplement artificial fertiliser. One man to five acres is considered quite usual in the flue-cured belt. During the curing season, extra hands are called in.

During the season of 1927, the writer worked on a farm in the Oxford area. There were eighteen acres of tobacco on this particular farm. Four people tended this crop up to

the time of curing. At that time the farmer's wife, his mother and his small daughter of nine were called out to supplement the field force. If we rate the man power of these three women to be equal to two men, we have a total working force of six. Thus, six people emptied and filled a barn in one day. The size of the barn was average, that is, about 16 ft. x 16 ft. x 20 ft. This meant work from five in the morning until nine at night, when the barn was eventually filled.

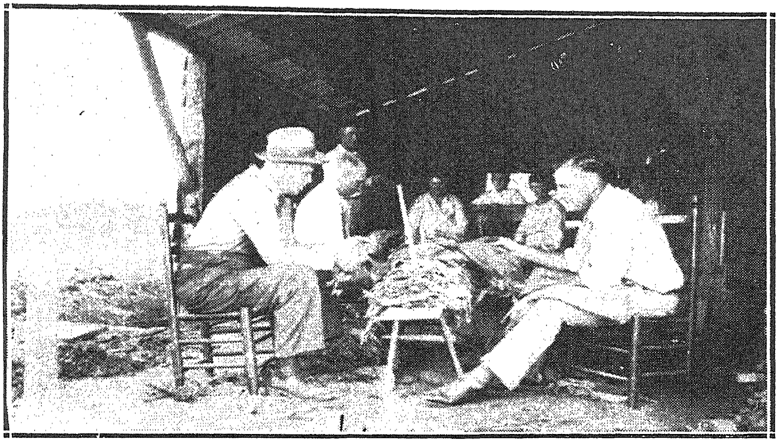
The method employed in filling a barn is somewhat different to that employed in this Colony. The four men would spend all of their time picking. The sled, or machila as it is termed in this Colony, pulled by a horse or mule, would move slowly between the rows. The harvesters would take four rows on either side of the horse—two rows per man. When filled, the sled would return to the side of the field where the women were handling and tying. When enough had been tied to fill a wagon, as seen in the illustration, it was driven to the barn and the leaf immediately hung on the racks. The reapers would, of course, usually be far ahead of the tier, and when it became too dark to distinguish ripe leaf properly, the harvesters would help tie the surplus that had accumulated. This done, the barns would be filled and the fires started. Turns were taken at sitting up during the night to cure. Only one man at a time attended the barns, and he did his own stoking as well.

Southern Rhodesia is, of course, handicapped by the labour question. In the Southern States labour is usually interested in the crop, in that ultimately all of the workers share in the profits. The cropper or tenant system is very popular in this part of the States. Very few big estates or plantations are left, due to the Civil War, when the slaves were freed, and chaos and mis-rule reigned for a number of years during the reconstruction period. Again, apart from not being interested, the labourer in this Colony is rather dense and lazy. The use of oxen, of course, is a very serious drawback. Apart from their slowness and clumsiness, their very equipment is apt to be ruinous to the crop. Despite these facts, however, one cannot help thinking that considerable time and money might be saved if the labourers were more closely supervised. Also, it would not be expensive to build small grass huts on the side of the field, and tie the tobacco there, that is, if the trees do not offer enough



Harvesting bright tobacco in Virginia.

A full crate which has just come from between the rows on its way to the tyers.



Grading tobacco on a Virginia farm. The man sitting on the left (front) is Mr. E. Y. Floyd, one of the best known tobacco men in the Southern States. A grading demonstration was being given by Mr. Floyd when this photograph was taken.

One of the warehouses in Wilson, North Carolina. It is not at all uncommon for over a million pounds of tobacco to be sold in one week at this particular warehouse.

shade. It would have the advantage of concentrating the labour at least, thus rendering supervision very much more easy.

The handling of tobacco after curing is also carried on in a slightly different manner in the States. The tobacco is removed from the barn and packed down while still on the sticks. It is left in this state for a few weeks, and is then taken and hung on tiers again until stripping or grading begins. All of the pack houses are fitted with tiers for this purpose. A good flow of air through the tobacco is thought to be a big factor in eliminating a great deal of the green colour which always exists in the leaf, no matter how well cured.

The crop is graded per barn, so to speak—that is, the sand lugs are graded first, and so on up the plant. In this Colony colour appears to form the keynote in grading. Not so over there. The American farmer, when grading, takes into account leaf texture, size and colour. On the farm the leaf is scarcely ever graded into more than ten grades. They adhere closely to the four main divisions, that is—

(1) wrappers,
(2) leaf,
(3) cutters,
(4) lugs.

The sub-divisions of these grades differ with the locality. That is, the names applied to them differ. For instance, in one part of Virginia a certain type of leaf is known as a smoker; in Carolina the same leaf may be termed a spongy cutter. The sub-divisions are really unimportant. A different name is often applied to them from farm to farm. What is important, however, is the recognition of the four main grades. Here again Southern Rhodesia is handicapped with her inferior labour. To explain to a raw native the difference between a wrapper leaf and a cutter would be difficult; to explain the difference between a wrapper and a leaf grade would be even more difficult. This is a hypothetical case, of course, for the occasions to explain what a wrapper was would be rare indeed owing to the corresponding rarity of the occurrence of wrappers in Rhodesian flüe-cured tobacco.

Finally, the marketing of the product is different, of course. Most of the farmers are undoubtedly familiar with

the method employed over there, and little need be said about it. The tobacco is taken to market, put in baskets on the warehouse floor, and is then sold by the auctioneer to the highest bidder. Much could be said, of course, concerning the various attempts at co-operative selling, but that is another subject, and one which would fill volumes.

In summing up the conditions attendant in each country, there are several points which would strike even a casual observer. Meteorological and hydrographic conditions do undoubtedly differ quite widely. The question of soil differences is somewhat involved, but it must be stated emphatically that the typical tobacco soil in America is better than that found in Southern Rhodesia. Then there is the question of labour. Many seem to think that in the native we have a great economic advantage over other countries. From the figures quoted in this article it will be seen that, as things are managed at present, he forms little or no advantage. Another disadvantage with our labour is its migratory or shifting nature, which disrupts organisation and means "breaking in" an almost completely new set of "boys" each year. The ox is another great stumbling block in our farming scheme. In America a great deal of machinery is used. Here the initial outlay for such machinery is much greater, and in the case of gasoline-run engines the cost of operation is prohibitive. Another outstanding difference is the size of the farms in this Colony. The total acreage of the individual farm here is ofttimes immense. The amount used for crops, on the other hand, is, comparatively speaking, negligible. It seems foolish to expect a few hundred acres of crops to justify the capital invested in thousands of acres which bring in no return whatsoever.

Lastly, we come to the standard of living in this Colony. Undoubtedly the type of farmer found in this Colony is unique. Any advantage derived from cheap labour is offset by his standard of living. In a world market he competes against the peasants of Europe and Russia, or more specifically against the farmer of the Southern States of America, whose standard is infinitely lower than his.

With regard to the future of the tobacco industry of this Colony, this must be left to others. That tobacco can be successfully grown in this Colony has been fully demonstrated. The problem now resolves itself into one of selling it to the best advantage.

Notes on the Control of some of the more Important Insect Pests of Citrus IN SOUTHERN RHODESIA.

By W. J. Hall, Ph.D., B.Sc., Entomologist to the British South Africa Company in Southern Rhodesia.

The object of the present article is to give a brief account of the more important pests of citrus in Southern Rhodesia and the steps that are being taken for their control on the British South Africa Company's estates.

In Southern Rhodesia citrus trees can only be grown, on a commercial scale, under irrigation. They consist almost entirely of budded trees, the varieties grown chiefly being Valencia Late, Washington Navel and Jaffa. The trees blossom from the end of July to the middle of September, and the harvest is reaped from early the following May until the end of September, according to the variety. The average annual rainfall at Mazoe, where the largest of the Company's estates is situated, is about 36 inches, and this falls almost entirely between the middle of November and the middle of April; the rest of the year is practically rainless, hence the necessity for irrigation. The hottest months are October and November, just before the rains break.

For the purpose of this discussion it will be convenient to take the crop through from blossoming to harvesting and to deal with each of the more important pests in turn as they occur.

The buds begin to swell for the spring growth between the end of June and the middle of July. From this time onwards the trees have to be very carefully watched for the citrus aphis, *Aphis tavaresi*, Del. G. This species is present on the trees the whole year round, and during the winter months small colonies can always be found on young trees

or bearing trees which are carrying some young growth. As soon as the temperature begins to rise and the spring growth pushes forth, these small surviving colonies increase rapidly. It is these which initiate the outbreak which annually reaches its maximum severity between early July and the latter part of September. An attempt is made to mark down the trees or areas in which colonies have survived the winter months. These are always to be found on the non-bearing trees or those trees that have put forth flushes of new growth during the winter. Such trees are kept under careful observation and sprayed before the insects become sufficiently numerous to give rise to an alate (winged) generation, the form which is responsible for the spread of the pest to the other trees and groves.

Considerable importance is attached to this early localised spraying, as it has been found by experience that the ultimate degree of attack may be considerably minimised by this means, resulting, of course, in lower expenditure on the ultimate control.

Seasonal conditions very largely determine the degree of the aphis attack, and it has been observed that, following a season of heavy summer rainfall, the attack is very much heavier than after a similar period of low rainfall. This is naturally what one would expect, because following a heavy rainy season there is correspondingly more new growth put forth during the winter months for the aphides to carry through upon.

Having done as much as possible in dealing with localised outbreaks, the main general outbreak usually occurs in August. The Washington Navel, being the variety which puts forth its spring growth first, is the first to become infected. The moment the attack is observed to have become general and to be going ahead, the fleet of power spraying machines is brought into action and all infected groves are sprayed as rapidly as possible, working always with the wind. *The critical period so far as aphis is concerned is between the swelling of the buds and the dropping of the petals.* It is absolutely essential that the pest should be kept under control during this period or very severe losses may be sustained. A very few aphides on a young and tender shoot will arrest the development of the blossom buds and

ultimately cause them to fall. A heavy aphis attack results in a poor blossoming, and the new crop suffers a loss at the very outset from which it can never recover. Once the petals have fallen the growth hardens up, and it can sustain a very much greater aphis population without causing appreciable damage. Every effort, then, is made to safeguard the trees until they come into full blossom; after that the trees are kept under observation, and only those groves that become heavily infested are sprayed; this is largely to prevent the formation of an excessive amount of honeydew, and subsequently of sooty mould. It has to be a very heavy infestation to cause the fruit to fall once it has set. The higher temperatures at the latter part of September automatically control this insect.

The spray used is lime sulphur, nicotine and spreader, the lime sulphur being included for its fungicidal properties. The most satisfactory formula is lime sulphur 1 part in 100 parts of water, 8 ozs. of nicotine extract (40 per cent. nicotine sulphate) and 8 ozs. of Capex spreader. The spraying fleet is of such dimensions that all the trees on the estate can be sprayed in ten days. This is very important when dealing with a pest that multiplies and spreads as rapidly as the aphis.

The second pest that makes its appearance is an unusual one so far as citrus is concerned—the cotton boll worm, *Chloridea obsoleta*, Ol. The moths commence egg-laying about 25th August and continue until the second half of September. The egg stage at this time of year averages about four days and the caterpillar stage about 26 days. The caterpillars are not readily seen until they are a week old, and usually escape observation until they are 10 days old. During September a greater or lesser infestation of these caterpillars occurs annually.

It is not known whether the cultivation of cotton in Southern Rhodesia was originally responsible for the activities of this pest, but it has been noted that where cotton has been grown on or near any of the estates the attack has been intensified.

The caterpillars feed principally on the young and newly set fruit. Unfortunately they do not confine themselves to a single fruit or finish one fruit before proceeding to the

next, but they move continually from fruit to fruit, and at a conservative estimate one caterpillar will damage 25 fruits irretrievably. It is a curious fact that the attack is localised and occurs in the same groves or groups of groves annually; these are always the most sheltered groves, which presumably provide more favourable conditions for the ovipositing females.

Previously the method of control adopted was to hand-pick the caterpillars. This did some good, but was by no means fully satisfactory, as the caterpillars are not observed by the orchardist until they are at least 10 days old, and by then a great part of the damage has already been done. Moreover, such a practice does not materially influence the following year's infestation, as several intervening generations are passed on other host plants.

It was noted that the eggs, though small, were easily seen on the young foliage on which they are usually laid. Knowing by experience which groves are usually attacked and when the first eggs are laid, boys have been trained to hand-pick the eggs. This has been tried out on a large scale on all the British South Africa Company's estates, and last year on one estate just under 42,000 eggs were collected at a cost of £61. This was a year of light infestation, and from a calculation of the number of caterpillars subsequently collected it is estimated that 40 per cent. of the total eggs laid were collected. In years of heavy infestation the eggs will be more numerous and consequently more easily found and the percentage efficiency of the campaign will be greater.

This method is by no means the last word in control, but owing to the relative cheapness of labour in Southern Rhodesia, the damage done by this pest can be considerably minimised thus at a very low cost. Spraying with an ovicide is not likely to be an economic proposition, even if a suitable spray could be found, because the period of oviposition extends over a period of at least 20 days. The length of the egg stage being only four days, five applications of spray would therefore be necessary, and this would prove costly. Theoretically the method of control is to bait or trap the moths when they come to oviposit, but so far no success has been met with in this direction.

The third pest which has to be dealt with annually is the citrus thrips, *Scirtothrips aurantii*, Faure. This is probably the most serious pest of citrus in Southern Rhodesia; the same species also gives trouble in some parts of the Union of South Africa. A detailed study has been made of this pest, and it is hoped that the results of this work will shortly be published and be available to all citrus growers in Rhodesia.

The citrus thrips can be found on the trees the whole year round. The individuals that have survived the winter months start to go ahead about 15th August, when the temperature begins to rise and there is any amount of young and tender foliage. The temperature continues to rise until the end of September, the thrip population meanwhile steadily increasing—always on the foliage. The thrips begin to attack the fruit as soon as it reaches the size of a large pea, and from then until it attains a diameter of 2½ to 3 cms. feeding takes place almost exclusively on the young fruits. The worst damage is done to the fruit when it is small and most tender, the injured tissue taking the form of a scabby or scurfy area.

It must be pointed out that thrip marking alone is rarely sufficiently bad to exclude a fruit from export, and it is a debatable point whether the loss occasioned by the lowering of the grade of fruit justifies expenditure on control measures. In Southern Rhodesia, however, climatic conditions during the rainy season result in tear-staining developing from the original thrip marking, and it is this subsequent indirect result of the initial thrip injury that is so extremely serious and renders it imperative that steps are taken to control the insect in question. A very heavy attack in certain groves of one estate was seen in 1928. Towards the end of November, when the thrip marking alone was present, it was estimated that at an outside estimate not more than 10 per cent. of the crop would be unfit for export. At the end of the rainy season, when the tear-staining had developed in addition, over 80 per cent. of the crop was unfit for export, and in two of the groves not a single fruit was sold—even locally.

The Washington Navel variety, being always most advanced, is the first as usual to be attacked. At Mazoe the

thrips generally migrate from the foliage to the fruits, on the Navel trees, about 20th September.

It has been found that the thrips can readily be killed by a lime sulphur and nicotine spray. Owing chiefly to the fact that the eggs are laid within the tissues of the fruits and leaves, a single application of spray is of very little use. A double spraying has to be given at an interval of nine days, this interval having been arrived at as a result of a study of the life history of the insect. It is necessary to emphasise that the same results cannot be obtained by spraying at any other interval.

The spray usually recommended against citrus thrips is a plain lime sulphur. In Southern Rhodesia the first application is made towards the latter end of September, when there is generally a certain amount of aphis still present, and for this reason nicotine is included. Whether the nicotine element in the spray is essential when dealing with thrips alone is not quite clear, and so far no definite conclusions have been arrived at. The fact remains that lime sulphur and nicotine have given excellent results, and one hesitates to eliminate the nicotine—expensive though it is—from the second application until more evidence is to hand. In this case the formula adopted is lime sulphur 1 part in 100 parts of water, 6 ozs. of nicotine extract (40 per cent. nicotine sulphate) and 6 to 8 ozs. of Capex spreader.

There are two points of vital importance if the thrip outbreak is to be controlled:—

Firstly: The first application must be given when the young fruit is the size of a pea, i.e., just before migration from the foliage to the fruits.

Secondly: The first application must be followed by a second nine days later.

The organisation of the campaign on a large scale is complicated by the fact that at any one moment there are always some groves under irrigation. Moreover, where a large number of groves are involved it is impossible to time the first application throughout so that the fruit is always at exactly the right stage. As soon as the newly set fruit in the most advanced grove is the size of a pea, all groves are sprayed. Owing to irrigation, three periods each of nine days are required for the campaign, and it is arranged that

the most backward groves are under irrigation during the first period, so that they do not get their first application until the second period.

The spray is applied by a power-driven machine at a pressure of 250 to 300 lbs. to the square inch, and the trees are thoroughly drenched inside and out. The size of the fleet of spraying machines is such as to permit all trees to be sprayed once in nine days.

The double spraying of all the trees should be completed soon after the middle of October. From then onwards it is only necessary to keep the groves under observation and to give a third application when and where necessary. At Mazoe last year control was effected with an average of 2.19 applications over approximately 50,000 trees.

There are certain factors which affect the degree of attack and the degree of control obtained which must be taken into consideration if the best results are to be obtained.

1. A heavy attack may be expected following a season of light summer rainfall, and *vice versa*.

2. The presence of out of season fruit in quantity on the trees during the winter months will lead to a heavier attack, whatever the previous summer rainfall has been. A heavy attack can follow a season of low rainfall if there has been a heavy out of season crop on the trees throughout the winter.

3. If the setting of the new crop is uneven it will be more difficult to effect control, and probably three applications of spray will be required, and the cost of control will, therefore, be greater. An even setting can usually be obtained if the irrigation programme is carefully studied.

4. A late setting. The reason for this is that the thrip population has longer to breed up on the foliage, with the result that when migration to the young fruits takes place the population is correspondingly greater and more damage is done.

5. A sharp shower of rain falling during the thrip spraying campaign will necessitate all those groves which have been sprayed within two days of the rain being re-treated. The reason for this is that the action of a lime sulphur spray is two-fold, primarily acting as a contact

insecticide and secondarily, I believe, as a stomach poison. This secondary action is lost if the spraying is followed by heavy rain, which washes off the film of spray.

It is impossible, in such a short article, to go into the question of the control of this pest in any further detail. It is only necessary to add that attention to certain aspects of cultural practice is essential or control will not be effected whatever spray is used or how and when it is applied.

Towards the latter end of November the thrip population tends to become large again, but the fruit is rapidly attaining such a size that it is immune from further injury and the thrips migrate back to any new and tender foliage that has been put forth as a result of early showers of rain. From then onwards the crop may be considered safe from any further injury by this insect.

In Southern Rhodesia it is necessary to make the thrip-spraying campaign a part of the annual routine of the estate, because it is impossible to prophesy what the degree of attack is going to prove and it is too late to save the crop when this becomes apparent. Thrip attack and the subsequent tear-staining may and have caused such serious losses in the past that the 2 per cent. premium which the campaign costs is money well spent if control can thus be effected.

It must be pointed out that any aphis sprayings which have been carried out between 15th August and 20th September, and particularly those in September, materially assist in the control of thrips. The habits of this species of thrip are such that it is impossible to get a 100 per cent. kill, and for this reason the control measures are designed to give a severe check to the insect just before the fruit becomes of a size to be susceptible to attack. This enables the young fruits to pass unscathed through that critical period of their development when thrips can be most injurious.

Once the rains break at the end of November one can breathe a sigh of relief, provided the crop has so far been safely steered over the various entomological hurdles, as the critical period is now over and nothing very serious is likely to happen.

In December the lowered temperature, together with the humid conditions prevailing, result in a secondary outbreak

of aphis. Soft scale—*Lecanium hesperidum*, L.—and red scale—*Aonidiella aurantii*, Mask.—also go ahead during the rains, i.e., between December and April. Very little can be done owing to the climatic conditions, but when and if a dry spell occurs any trees or groves badly infested with aphis are sprayed, or if attacked by soft scale or red scale, they are fumigated.

In seasons of excessively heavy rainfall an attack of fruit-piercing moths may occur in March. During the three years I have been in Rhodesia we have had no visitation of this pest, so with the exception of seeing one or two isolated specimens, I have had no opportunity of studying it. In the year 1923 it took heavy toll of the crop.

The last pest of major importance is red scale. This really should have been taken first, because the control measures affecting any one crop have to be taken a year previously. Conditions are such in Rhodesia that if the crop becomes heavily infested with red scale we cannot save that fruit; we can only attempt to prevent a similar occurrence from taking place the following year. The reason for this is that we can only fumigate on a large scale when the fruit is to all intents and purposes fully developed, so that even if the scale is killed there is no time for it to drop off and the fruit to recover.

It is only possible to fumigate on a large scale between the end of April and the end of June, i.e., between the end of the rains and the advent of the new spring growth. All the trees are fumigated annually and the whole campaign has to be completed in ten weeks. The Cyanofumer method has been adopted and has given satisfactory results. Two gangs are worked, each with a Cyanofumer and 60 tents. Work is started about 4 p.m. or later, according to the temperature, but never earlier, and the task is fixed at ten throws a night. Owing to various factors, chiefly wind, the campaign last year got behind-hand and the spring growth appeared unusually early, whilst there were still some 5,000 trees to be treated. These were safely negotiated; but there is always a certain amount of risk in treating trees that are putting forth new growth, and it is not a practice to be recommended. In this case it was unavoidable, and it was noticed that whereas the new shoots of about 3 inches

in length were burnt off, those under $1\frac{1}{2}$ inches remained untouched. This, of course, was an advantage, as the growths of 3 inches and over were so advanced as to be almost out of season.

Red scale may be a very serious pest indeed, but the general annual fumigation that has been undertaken the past three years has cleaned up the trees to such an extent that the loss from this insect is now practically negligible. Whether fumigation alone will continue to control this pest in future years remains to be seen.

The introduction of an annual fumigation campaign has almost completely controlled soft scale, which was a serious pest in past years at Mazoe—curiously enough, more so at Mazoe than on the other estates. It must be added that soft scale is always much more troublesome on young non-bearing trees than on older trees, and the fact that there is a very much smaller percentage of non-bearing trees at Mazoe than there was four years ago has no doubt also contributed to the lowered degree of soft scale attack of recent years.

I do not propose to deal with any other pests; such as they are, these are of a minor nature or spasmodic character. Fruit flies hitherto have given us little trouble, and the false codling moth, which is considered a major pest in some parts of the Union of South Africa, is hardly serious with us as yet, although we do sustain some loss from this cause and it is probable that an investigation will shortly have to be undertaken.

In conclusion it may be of some interest to indicate what the control measures previously mentioned cost on a relatively large scale. For this purpose it is convenient to base all costs on the average per bearing tree. Last year at Mazoe, where approximately 50,000 bearing trees were dealt with, the costs worked out at—

Fumigation	1s. 0d.	per tree.
Thrip-spraying campaign	0s. $9\frac{3}{4}$d.	per tree.
Aphis-spraying campaign	0s. $2\frac{1}{4}$d.	per tree.

The cost of hand-picking the eggs of the cotton boll worm was so small that it has been disregarded. The total cost, then, of the control measures was an average of 2s. per tree, and the resultant crop is estimated at 150,000 ex-

port cases or three cases a tree. Assessing the value of a case of fruit at 17s. 6d., 2s. has been expended per £2 12s. 6d. In other words, the premium for insect control was approximately 4 per cent. This is not a high figure when it is remembered that cases have occurred where thrip alone has reduced the exportable crop by 50 per cent.

It may be argued that the present article only discusses insect control on a large scale and that the recommendations are of little value to the citrus grower on a small scale. It is, therefore, necessary to emphasise that the principles of control are the same whether a greater or lesser number of trees are involved. The only difference lies in how the measures are applied; the economic expenditure on equipment is determined by the number of trees and their average yield. For instance, it may not be economic to run a Cyanofumer or power spraying machines on a small number of trees, but there are other methods of fumigation and types of spraying machines that may be adopted at a very much lower cost. Every estate or block of trees has to be considered separately to assess what will prove the most economic form of equipment for insect pest control, and no general rules can be laid down.

It has only been possible to skim over the ground in the present article, as the subject is very wide, but it is hoped that the citrus growers of Rhodesia may find something herein of interest and value.

RHODESIAN MILK RECORDS.

In the official milk records published in the June issue of this Journal appeared the name of E. MacPherson, Figtree. This should have read E. E. Macpherson, Figtree. In the list of semi-official milk records appearing in the same issue, grade Friesland cows Freckles and Patience are shown as the property of F. B. Morrisby. These cows are grade Ayrshires and owned by Mr. E. E. Macpherson.

Pan-African Veterinary Conference.

The following resolutions were passed at the conference held in Pretoria in August last:—

SWEATING SICKNESS.

In view of the continued spread of sweating sickness in Southern Africa, this conference urges that research work on this subject be continued with the object of elucidating the nature of the disease and, if possible, finding a method of prevention and cure.

CONTAGIOUS ABORTION AND MALTA FEVER.

(1) This conference recognises the close relationship which exists between the different varieties of the Brucella group of organisms, and feels strongly that further research work on the relationship of the organisms responsible for contagious abortion in cattle and undulant fever in man is an urgent necessity.

(2) This conference appreciates the shortcomings of known methods of vaccination against contagious abortion and our lack of knowledge in regard to the results obtained from vaccination; it consequently recommends that further research be carried out with a view to improving the vaccine and obtaining reliable statistics on its value in practice. Meanwhile the conference feels that the use of live vaccine in badly infected herds is indicated.

(3) The conference also feels that further work is required:—

(a) to determine the distribution of Brucella abortus in the animal body, apart from the genital organs and mammary gland; and

(b) to eliminate the infection from the carrier.

(4) The conference considers that further studies on the viability of the causal organism outside the animal body are called for.

(5) This conference recognises sterility as one of the most important results of contagious abortion in cattle, and

considers that more attention should be paid to this condition, especially in pure-bred cattle.

RINDERPEST.

1. **Distribution**.—All countries south of Tanganyika Territory and the Belgian Congo seem to be free of rinderpest. North of Tanganyika Territory and the Congo the infection is widespread.

2. **Danger of Spread of Infection Southwards.**—It is conceivable that infection might spread southwards by the instrumentality of two agents, namely (a) Cattle, and (b) Game. Regarding the former, there appears to be little danger, while in the case of the latter past experience has shown that such played a large part in the spread of rinderpest. It is the opinion of the conference that game constitutes a most serious menace in the control and eradication of the disease, and this factor must not be overlooked in the possibility of a southern spread of rinderpest.

3. **Policy in Combating the Disease.**—It is evident that conditions vary so widely from country to country that no single method of dealing with the disease can be recommended as applicable to all. It is recommended that the general policy of eradicating the disease should be adopted by all countries, and for this purpose the closest co-operation between infected territories is essential.

BOVINE PLEURO-PNEUMONIA.

1. Bovine pleuro-pneumonia exists in the following territories on the African continent:—

(1) Northern Rhodesia. (Confined to Baroke native province.)
(2) Portuguese Angola.
(3) Tanganyika.
(4) Kenya.
(5) Uganda.
(6) Sudan.
(7) Gold Coast.
(8) Gambia.
(9) Nigeria.
(10) French West Africa.
(11) Belgian Congo (Localised).

It is also possible this disease exists in other territories unrepresented at this conference.

2. In view of the serious economic importance of bovine pleuro-pneumonia and the danger of the disease spreading to neighbouring territories, this conference strongly urges all administrations, where the disease exists, to take all possible measures for its complete eradication at the earliest opportunity.

3. The measures this conference recommends for the eradication of bovine pleuro-pneumonia are as follows:—

(a) Slaughter of all cattle in all isolated outbreaks in countries otherwise free of disease.

(b) Slaughter of all clinical cases of the disease, with adequate compensation.

(c) Quarantine of infected areas.

(d) Vaccination.

4. The conference is of opinion that serum diagnosis has been shown to be of some value in the detection of the disease, and this method should be considered in conjunction with the other measures advocated.

5. It is also recommended that further research work should be carried out to determine the immunising properties of vaccines of varying virulency.

6. In view of the successful results obtained in the Union of South Africa and more recently in the Bechuanaland Protectorate, the conference has every reason to suppose that if these recommendations can be put into practice in the respective infected territories the complete eradication of bovine pleuro-pneumonia can be confidently anticipated.

(a) EAST COAST FEVER AND OTHER TICK-BORNE DISEASES. (b) TICK CONTROL.

(a) East Coast Fever.

(1) This conference recognises the fact that East Coast Fever is enzootic in various parts of Eastern Africa and that consequently the problem in those areas is an entirely different one from that in Southern Africa, where there is no evidence of it becoming enzootic.

(2) This conference further recognises that in enzootic areas control measures are only feasible, while in Southern Africa total eradication must be aimed at.

(3) This conference realises that in areas where the disease is enzootic, control of the disease must consist largely in applying measures to reduce the mortality to a minimum.

(4) This conference is definitely opposed to the application of any known method of immunisation in non-enzootic areas, such as Southern Africa, but considers that further research in that connection might be undertaken in areas where the disease is enzootic.

(5) This conference, after carefully reviewing the East Coast Fever position in Southern Africa, is of the opinion that as the incidence of the disease has been reduced to such relatively narrow limits, most energetic measures by all South African territories should be adopted in order to arrive at final eradication.

(6) The measures recommended by the conference under (5) are as follows:—

(a) Close supervision of all suspected areas with the object of obtaining an early and certain diagnosis. For this purpose a careful check on all cattle is essential.

(b) Close quarantine of all infected and suspected areas and strict control over the movements of all cattle in such areas.

(c) Slaughter or removal of all cattle from the infected farm or area and leaving such a farm or area free of all cattle for a period of at least 15 months. It is realised that this method, although recognised as most effective for early eradication, may not always be practicable or advisable.

(d) Where slaughter or removal is not practicable or advisable, short-interval dipping (not exceeding five days) at the approved strength and hand-dressing must be rigorously enforced.

(e) Fencing of all infected areas and such other adjoining areas as local circumstances may require.

(f) Branding of all cattle in infected and suspected areas.

(g) The immediate destruction of all cattle that are infected or suspected to be infected with East Coast Fever.

(h) An adequate and efficient staff is essential for carrying out any or all of these measures.

(b) Tick Control.

This conference is of opinion that further research work should be undertaken on the problem of dipping, more particularly on the following lines:—

(1) The way in which ticks are killed by dipping agents.

(2) Finding a substance which will be more effective than arsenic for killing ticks and, if possible, less injurious to cattle.

(3) The discovery of an agent that would have some repellent action against the ticks.

AVIAN DISEASES.

This conference recognises the phenomenal growth of the poultry industry in recent years and the consequent increasing importance of avian diseases. It strongly urges that full attention be given to the study of this subject.

VETERINARY ADMINISTRATION AND LEGISLATION WITH SPECIAL REFERENCE TO THE POSSIBILITY OF INTER-TERRITORIAL CO-OPERATION IN THE CONTROL OF THE MAJOR DISEASES OF STOCK.

This conference resolves:—

(1) That the usual monthly reports of outbreaks of notifiable diseases of stock be forwarded to all territories in Africa where a veterinary service is maintained.

(2) That, in the event of any outbreak of a major notifiable disease or any change in the position as regards existing outbreaks in any territory, immediate information should be forwarded by that

territory to all territories bordering upon it or likely to be affected by the disease.

(3) That, as soon as information is received by territories that a menace exists from a formidable disease of stock, immediate liaison should be established with a view to the adoption of combined measures for its control or eradication.

(4) That, in the event of the measures agreed upon necessitating the immunisation of animals upon a large scale, those territories in which special facilities exist for the production of immunising material should endeavour to assist by taking steps to meet the demand.

(5) That, in the event of a major notifiable disease existing in two or more adjoining territories and steps being taken to eradicate or control the disease in any one or more of them, it should be incumbent upon the other territories to take equally effective steps.

BLACK QUARTER.

1. Since the causal organism of black quarter is generally accepted to be a saprophytic anærobe which can multiply in the soil of certain localities, the conference appreciates the difficulties in the way of its eradiction.

2. As the result of recent scientific research, most effective and relatively cheap vaccines are now available for use against the disease, so that with a little care and foresight stock owners need not suffer any losses from this cause.

3. In Southern Africa natural causes of black quarter occur mostly in young bovines and sheep (after shearing). By protective inoculation losses from the disease in these classes of stock can be prevented entirely at a very small cost.

SHEEP SCAB.

In view of the progress towards scab eradication that is being carried out in the Union of South Africa and Basutoland, this conference strongly urges a similar effort should be adopted in the remaining sheep-bearing territories of Southern Africa.

ANTHRAX.

1. This conference recognises the great economic importance of this disease, and appreciates the danger of infection to which workers handling hides and wool are exposed.

2. The conference therefore recommends that active steps for its control and eradication be taken by the different states in Africa where the disease is present. The most important measures for its control are:—

(a) Proper disposal of all infected carcases.

(b) Annual vaccination of stock in infected areas with a reliable vaccine.

3. The conference realises that very little is known regarding the viability of the causal organism outside the animal body and is of the opinion that further research in this direction is very necessary.

DISEASES OF GOAT SKINS.

In view of the economic importance of the trade in skins of goats in certain territories and the loss occasioned by skin diseases, more particularly demodectic mange, this conference is of the opinion that further research should be undertaken for the purpose of finding a reliable cure or preventive for these diseases which is practicable in the field.

PLANT POISONING IN STOCK.

This conference feels that plant poisoning in stock is of great economic importance, and suggests that extensive field and laboratory investigational work be undertaken, especially with reference to etiology, pathogenesis, prophylactic and curative measures.

RABIES.

This conference recognises the importance of rabies in Africa and the need for further investigation of various aspects of the problem. The fact that the disease appears to have become enzootic in wild carnivora in various parts of Africa makes the task of total eradication well-nigh impossible. On the other hand, the comparatively dormant state of the disease in many areas renders it less dangerous

and less likely to spread than the European form of the disease, and fully justifies the policy adopted in certain African States of rigorously excluding dogs from all countries where rabies exists.

ANIMAL DISEASES IN NATIVE TERRITORIES.

After discussion, this conference desires to place on record the following few facts:—

(1) Disease eradication in native areas is rendered difficult on account of various factors, among which may be mentioned:—Native ignorance and prejudice, native customs, poor quality of stock and over-stocking, communal grazing and watering, lack of fencing.

(2) It is realised that most of these difficulties could be overcome only by practical education and ocular demonstration, and that such education must of necessity, and in the interest of the native, be a gradual and slow process.

(3) There must be the closest co-operation between native and veterinary administrations in all matters affecting native stock.

POST-GRADUATE COURSE.

This conference recognises the great need for special training in tropical veterinary science to be given to all veterinarians destined for service in any African territory. It is felt that a post-graduate course at Onderstepoort or other institutions capable of giving similar facilities should prove of very great assistance in this direction.

(A) THE TRADE IN PURE-BRED AND IMPROVED GRADE STOCK BETWEEN AFRICAN STATES.

This conference is of the opinion that the trade in pure-bred and improved grade stock between the States represented at this conference would be encouraged and safeguarded if arrangements could be made whereby stock purchased by one State from another could be inspected and passed as conforming to the required type by a Government official of the exporting State.

In each case the standard in regard to such points as constitution, colour, type and area of origin should be defined by the importing State.

The purchase should preferably be made through the breed society concerned. A copy of the communication addressed to the breed society should be sent to the Department concerned of the exporting country with a request to co-operate in the selection of the stock required.

The conference is also of the opinion that the Government of the Union of South Africa should be requested to take the initiative in approaching the Governments of the States represented at the conference in order, where possible, to give early effect to this resolution.

(B) THE GRADING UP AND IMPROVEMENT OF INDIGENOUS CATTLE.

This conference is of the opinion that, while the grading up of the indigenous cattle in the various African States is very necessary, it is not possible to lay down a definite breeding policy at this stage and that the methods of improvement to be followed will have to be determined by local conditions and experience.

In this regard it is felt that a full and constant interchange of information on the subject between the different African States would be of great assistance to those Governments which desire to encourage the grading up of the indigenous cattle in their territories, and that the Government of the Union of South Africa be requested to take the initiative in bringing about such exchange of information.

DAIRYING.

1. This conference recognises the great economic importance of the dairy industry and notes with satisfaction the progress which is being made in the development of the industry in the Union of South Africa, and considers there is great scope for its further development in other parts of Africa.

2. (a) This conference recognises the importance of a reasonably high standard in respect of the solids-not-fat content of milk being adopted.

In most parts of the world a standard of 8.5 per cent. is accepted, and although little information in regard to the solids-not-fat content of milk produced in African States is available, the conference recommends that until more conclusive data are obtained this standard should be adhered to.

It urges that further research in this connection be carried out as early as possible.

(b) This conference feels that it will prove advantageous to manufacturers and producers if all milk for manufacturing purposes is purchased on the basis of its butter-fat content.

3. This conference recognises the danger of disease being conveyed to human beings by the consumption of milk and its products, especially in the raw state. In this regard it wishes particularly to focus attention on the presence of tuberculosis in dairy herds.

The conference considers that while the incidence of the disease in African States is still low when compared to European countries, it is essential, in the interests of all States concerned, that early and effective steps be taken for its eradication.

In order to minimise the dangers to which consumers of milk are exposed, the conference urges on local authorities the extreme necessity of regular veterinary inspection of dairy herds with a view to eliminating clinically infected animals. In order further to minimise the dangers of spreading milk-borne epidemics through milk, the conference recommends that all persons handling milk be medically examined at regular periods.

GAME AND ITS RELATION TO STOCK PROBLEMS AND *GLOSSINÆ*.

This conference is of the opinion that:—

(1) The preservation of all existing species of African mammals, with the exception of those directly dangerous to man, is both desirable and necessary.

(2) The presence of game in settled areas, however, is a constant menace to stock, crops and general agricultural development. In this connection special emphasis must be laid on the relation of

game to such epizootic diseases as rinderpest and their capacity for acting as hosts to many endo- and ecto-parasites of domestic animals.

It is therefore uneconomical and unjustifiable to endeavour to enforce game preservation in such areas.

(3) Adequate and efficiently controlled reserves should therefore be established away from settled areas.

(4) Existing scientific evidence is now sufficient to justify the following conclusions:—

(a) Game constitutes the most important reservoir of the trypanosomes pathogenic to domestic animals.

(b) Game constitutes the most important source of food to the open forest tsetse flies, such as *G. morsitans* and *G. pallidipes*.

(c) The disappearance of these species may be expected to follow radical reduction of all game animals in any area.

(5) To ensure the perpetuity of game reserves and to prevent their constituting a menace to the surrounding districts, they should be free from *Glossinæ*, with a reasonable prospect of so remaining.

Seeds for Sale, Gwebi Farm.

		s.	d.
Boer Manna	per lb.	0	4
Napier Fodder Roots	per bag	6	0
Edible Canna	per 100 "tubers"	9	0

All prices quoted are for *delivery free at any station or siding* in Southern Rhodesia. Before sending cheques, intending purchasers are advised to ascertain that the seeds, etc., required are still available. Cheques should be made payable to "Gwebi Farm." All orders and enquiries should be addressed to the Chief Agriculturist, Department of Agriculture, Salisbury, *not direct to the Gwebi Farm.*

Talks to Poultry Keepers.

GREEN FOOD.

Issued by the Poultry Branch of the Department of Agriculture.

The results of not supplying sufficient green food to poultry are: (1) infertile eggs, (2) weak germs, (3) weak chicks, (4) ill-health and death, (5) fewer eggs, (6) smaller eggs, (7) pale coloured yolks, (8) retarded development, (9) retarded maturity.

The above results (there are others) are sufficient to prove to the poultry keeper of what importance it is to him to see that his birds have sufficient green food; in fact they can hardly have too much. Dealing with No. 4 above, the writer was called in to see some chicks recently which were dying by several per day. The sole cause was lack of green food (lack of vitamin A). This causes a disease in fowls of all ages, but especially in chicks when they are growing their crop feathers. It is called, for want of a better name, "nutritional disease." The symptoms are not unlike nasal and eye roup. It has sometimes been called "nutritional roup," which is quite a misnomer, for there is no smell of roup, nor is the roup bacillus present.

The symptoms are as follows:—Loss of appetite, listlessness and weakness, swollen and watery eyes. Later the eyes become filled with a cheesy, pale yellow matter. The birds usually lie on their sides in a comatose condition till they die. Small yellow spots are sometimes seen in the mouth and throat. These are different from the patches seen in diphtheritic roup, which are of a dirty yellow colour and large. Such cases do not need medicine; they need fresh green food which is rich in vitamin A (cod liver oil also contains vitamin A).

If chicks and fowls have access to plenty of green fresh food, this condition never occurs. Sometimes, however, enough green food is not available, due to dry weather or lack of growing vegetation within ranging distance.

Separated milk to some extent supplies the vitamin A that is necessary, but not in the quantity green food does; and skim milk has not as abundant a supply of vitamin A as whole milk has.

Cod liver oil, given to sick birds in 5 to 10 drop doses or mixed in the mash in the proportion of 5 per cent. by weight, improves conditions slightly. It contains vitamin A, but again not in the quantity green food does. The only preventive and sure cure for this ailment is *plenty of fresh green food*.

Notes from the Irrigation Branch.

Umshandige Gorge Project.—During a recent visit to Victoria the Premier and the Minister of Agriculture took the opportunity of inspecting the dam site at the Umshandige Gorge and the land commanded by the scheme. They appeared to be impressed with the possibilities of the project, which offers unique opportunities for a land settlement scheme on a somewhat different basis from others previously attempted in this Colony.

A detailed survey of the arable lands commanded by the scheme is being carried out by Mr. Craig, Inspector, of the Lands Department, and it is probable that the results of this survey will be the deciding factor in the scheme. In the portion of the area investigated to date 1,000 acres of suitable irrigable land have been located in patches varying in extent from 300 to 50 acres. The fact that the irrigable land does not exist in one continuous stretch is rather an advantage, as it will enable the area to be sub-divided into a number of farms of moderate size with a limited extent of irrigable land available in each farm. The irrigation survey party are at present engaged in locating the routes for the high level

canals on both banks of the river, and the work should be completed about six weeks hence. On completion, the party will probably be utilised for making a preliminary reconnaissance of a storage site on the Papotekwe River on the eastern side of Victoria, where very favourable conditions also exist.

Irrigation Developments, Eastern Districts. — Mr. Roberts, Assistant Engineer, who has recently completed a tour through the eastern districts, contributes the following notes:—

Umtali and the neighbouring areas present many interesting features from the point of view of irrigation and allied uses of water, and a visit to those districts reveals many extensive green stretches of land on which are grown lucerne, barley, wheat and other cereals, and in addition citrus and deciduous fruits.

Several irrigation schemes of some magnitude have, as is well known, been constructed on the larger rivers and serve a number of farms en route, but in addition there is a numerous and growing class of minor schemes for the irrigation of 10 to 50 acres on individual farms. These districts offer numerous facilities for cheap schemes of this nature, which have proved invaluable adjuncts to the mixed farming operations which are practised in this portion of the Colony.

Further south, near Chipinga, there are also plenty of useful streams, and on the Tanganda River an advanced stage of development has been reached. The upper waters are used to good purpose on the plantations of the Rhodesian Tea Company, where tea on a commercial scale will be produced in the near future. On a lower portion of the same estate another diversion furrow for the irrigation of field crops is in process of construction. Fifteen miles further down a scheme is projected for the irrigation of land in a native reserve which suffers from a very erratic rainfall. Near the junction of the Tanganda and Sabi Rivers the headworks and canal of the Sabi Valley Development Company's estate are located, which are designed for the irrigation of 600 acres. Owing to the poor rainfall in this locality, the irrigation of summer crops is carried out on this estate. It is encouraging to note that all this development has taken place in a district so remote from the railway, which is over 100 miles away.

Mole Drainage.—A valuable article entitled "The Application of Mole Draining to Scottish Soils" was published in the Scottish Journal of Agriculture for January, 1930. The following extracts from this article are of interest:—

"During the last decade some of the land has been drained through assistance afforded by Government grants. But the cost of work is high, being rarely under £20 per acre. This being so, we turn with interest to examine the claims of mole draining, which is said to cost about £2 10s. per acre and can be carried out at the high speed of two to three acres per day.

"The Ayrshire mole draining plant consists of a Fordson tractor of 24 h.p. The front wheels are of motor car type and are fitted with pneumatic tyres; the rear wheels are of the usual tractor design. To the rear end of the tractor is fitted a patent Maybet winch driven by belt and pulley from the engine shaft and working on a reduction gear of 30 to 1. The winch drum, 8 inches in diameter, carries a steel rope which may be payed out to any length up to 200 yards. The free end of the rope is securely fixed to the forward end of the mole plough, which may be drawn through the soil by the pull of the wire rope, the tractor being secured from running backwards by a field-gun spade attachment let down on a pivot behind the rear wheels. The mole draining plough is a two-wheeled carriage made of heavy steel angle-iron, the wheels being fitted with pneumatic tyres. Its portability is such that, although weighing some 7 cwt., it can be fixed by one bolt to the rear of a motor car and towed at 20 miles per hour.

"The mole plough can draw a drain 3 to 4 inches in diameter at all depths up to quite 30 inches.

"Mole drains cut in boulder clay in 1918 are still running. The most experienced farmers request drains of 4 inches diameter, with 14 inches of cover and set 3 to 4 yards apart at a grade of 1 in 100."

C. L. R.

Index to the Literature of Food Investigation.

(*His Majesty's Stationery Office, Adastral House, Kingsway, London, W.C. 2; 2s. net.*)

At the Imperial Agricultural Research Conference, held in October, 1927, it was decided that "Research Institutions of the Empire" should be kept abreast of progress in preservation and transport of food, and the following method was recommended:—

(a) Each Research Institution of the Empire to forward all its publications on preservation and transport of food to the Low Temperature Research Station of the Department of Scientific and Industrial Research at Cambridge.

(b) The Low Temperature Research Stations to issue, from time to time, to the other Research Institutions of the Empire lists consisting of elaborated titles of useful publications.

We have now received the second of these lists, which is divided into fifteen sections dealing with meat, pig flesh, poultry and game, fish, eggs, dairy produce, fats and oils, fruit and vegetables, grain, crops and seeds, theory of canning, theory of freezing and chilling, bacteriology, mycology, engineering and miscellaneous, occupying 147 pages.

The principal object of these lists is to put workers in one part of the Empire in touch with those who, in other parts, are working on the same problems. Workers are therefore invited to write to the Superintendent of the Low Temperature Research Station, Cambridge, stating their problems and specifying clearly the information they want on the subjects set forth in the list.

Southern Rhodesia Weather Bureau.

MAY, 1930.

Pressure.—The mean barometric pressure was considerably above normal, varying from 0.108 in. above normal at Umtali to 0.052 in. above normal at Salisbury.

Temperature.—The temperature for May was generally low. The mean temperature varied from 4.9° F. below normal at Gatooma to 0.9° F. below normal at Shamva.

The mean maximum temperatures were below normal, varying from 6.6° F. below normal at Hartley and Gatooma to 0.1° F. below normal at Shamva.

The mean minimum temperatures varied from 3.9° F. below normal at Sinoia to 0.2° F. above normal at Salisbury.

Relative humidity was above normal in the south and east, but was slightly low in the north.

Rainfall.—The following is the rainfall for the month of May in the various zones:—

ZONE A.—

Bubi—	
Bembesi Railway	0.20
Bulalima-Mangwe—	
Centenary	0.25
Riverbank	0.02
Solusi Mission	0.09
Bulawayo—	
Keendale	0.40
Crowhurst	0.02
Observatory	0.17
Waterworks	0.15
Gwelo—	
Gwelo Gaol	0.06

Nyamandhlovu—	
Gwaai Reserve	0.20
Umzingwane—	
Springs	0.25
Wankie—	
Sukumi	0.03
Tom's Farm	0.01
ZONE B.—	
Belingwe—	
Bickwell	0.23
Sovelele	0.60
Tamba	0.50
Wedza	0.52
Bulalima-Mangwe—	
Semokwe Reserve	0.08
Chibi—	
Nuanetsi Homestead	0.79
Nuanetsi N.C.	0.80
Gwanda—	
Gwanda Gaol	0.52
Mazunga	0.82
Mtetengwe	0.43
Tuli	0.12
Insiza—	
Albany	0.29
Inyezi	0.32
Scaleby	0.70
Matobo—	
Bon Accord	0.21
Holly's Hope	0.20
Matopo Mission	0.33
Mtshabezi Mission	0.29
Rhodes Matopo Park	0.09
Umzingwane—	
Essexvale	0.13
ZONE C.—	
Charter—	
The Range	0.30

Gwelo—	
East Clare Ranch	0.07
Lalapanzi	0.14
Wold Farm	0.09
Hartley—	
Ardgowan	0.18
Carnock	0.10
Eiffel Blue Mine	0.06
Gatooma	0.03
Gowerlands	0.09
Pulham	0.04
Lomagundi—	
Dedsi	0.12
Mica Field	0.21
Pendennis	0.10
Robbsdale	0.04
ZONE D.—	
Darwin—	
Cullinan's Ranch	0.05
Inyanga—	
Inyanga	0.20
Juliasdale	1.58
Rhodes Estate	1.58
Mazoe—	
Ceres	0.01
Citrus Estate	0.01
Dandejena	0.02
Hinten	0.12
Salisbury—	
Goromonzi	0.01
Meadows	0.02
ZONE E.—	
Bikita—	
Angus Ranch	0.85
Bikita	1.80
Chibi—	
Lundi	1.85
Mpapas	1.25

Chilimanzi—	
Allanberry	0.27
Felixburg	0.20
Induna Farm	0.38
Mukowries	0.41
Gutu—	
Eastdale Estates	0.15
Inyanga—	
St. Trias' Hill	1.59
Insiza—	
Stoneham (Brae Valley)	0.79
Makoni—	
Craigendoran	0.81
Forest Hill	0.80
Kairidzi	0.22
Mona	0.30
Monte Cassino	0.13
Rusape N.C.	0.16
Springs	0.31
Whitgift	0.46
Marandellas—	
Bonongwe	0.19
Delta	0.25
Macheke	0.05
Wedza Reserve	0.36
Melsetter—	
Brackenbury	1.79
New Year's Gift	1.37
Sabi Tanganda Estate	1.24
Ndanga—	
Bangala Ranch	0.85
Doornfontein	0.95
Zaka	0.68
Selukwe—	
Aberfoyle Ranch	0.76
Hillingdon	0.80
Impali Source	0.83
Rio	0.60
Safago	0.47

Umtali—	
Argyll	0.43
Fern Valley	1.61
Jerain	0.37
Mountain Home	2.83
Odzani Power Station	1.36
Premier Estate	0.27
Sheba	3.11
Stapleford	1.35
Umtali Gaol	1.02
Victoria—	
Cambria	0.25
Chevenden	1.58
Kimberley Ranch	0.18
Mashaba	1.10
Riverdene North	0.66
Silver Oaks	0.51
Victoria	0.15
Zimbabwe	1.42
ZONE F.—	
Melsetter—	
Chikore	2.77
Chipinga	2.60
Lettie Swan	1.78
Melsetter	3.01
Mount Selinda	3.10
Umtali—	
Cloudlands	1.38

Export of Cattle from Southern Rhodesia, 1930.

Month	Union		Eng-land.	Congo		N. Rhodesia.		Portuguese East Africa.		Total
	Slaughter		Slaugh-ter							
	Johannes-burg	I.C.S. for overseas	On hoof	Slaughter	Breeding	Slaughter	Breeding	Slaughter	Breeding	
January ...	...	...	...	2,449	67	...	...	...	...	2,516
February ...	...	...	...	3,438	8	537	91	...	11	4,085
March ...	25	...	160	1,097	...	249	...	...	7	1,538
April ...	53	863	...	2,636	115	120	...	...	...	3,787
May ...	783	1,628	160	1,517	593	268	...	...	...	4,949
June ...										
July ...										
August ...										
September ...										
October ...										
November ...										
December ...										
	...	...	...	...	...	...	...	...	...	...

Dates of Meetings of Farmers' Associations, Southern Rhodesia.

Name of Association.	Place of Meeting.	Secretary.	July.	Aug.
			1930	1930
Ayrshire—Sipolilo	Various farms	G. H. Cautherley	12	9
Banket Junction	Banket Hotel	A. M. Hutchinson	5	2
Beatrice District	Farmers' Hall, Beatrice	W. Krienke	31	28
Bindura	Bindura Farmers' Hall	W. E. Fricker	11	8
Bromley	Farmers' Hall, Bromley Siding	E. Taylor	2	6
Bubi	Queen's Mine	W. H. Perham	18	15
Bulawayo Landowners' and Farmers' Association	Library Buildings, Bulawayo	T. B. Hepburn	1	5
Chakari	Various farms	R. Codrington	17	21
Daisyfield	Somabula (July), Daisyfield (August)	L. E. Edwards	12	16
Darwendale—Trelawney	Various farms	Charles H. Tanner	23	27
Eastern Districts	Farmers' Hall, Chidza	W. E. Richards	12	9
Enkeldoorn	Enkeldoorn	C. N. Ludlowe	1	5
Enterprise	Farmers' Hall	E. P. Venables	1	5
Essexvale	Essexvale	Col. D. Judson	20	17
Felixburg—Gutu	Felixburg Store (July), Fairburn (Aug.)	E. C. Fleetwood	12	9
Figtree Branch, R.L. and F.A.	Figtree Hotel	The Secretary	1	5
Gadzema	Gadzema Hotel	H. G. M. Liddell	11	8
Gatooma	Speck's Hotel	Col. J. A. Smith	19	16
Gatooma (Golden Valley Branch)	Golden Valley Hotel	C. K. James	12	9
Gazaland (South Melsetter)	Farmers' Hall, Chipinga	J. Ward	19	16
Greystone	Quarrie Farm	P. J. van der Walt	12	...
Gwanda	Lowenthal's Building, Gwanda	N. J. B. Nilson	19	16
Hartley	Hartley Hotel	Mrs. F. C. Watson	12	9
Headlands	Headlands	J. A. Eve	...	...
Hunter's Road	Hunter's Road	R. W. Twilley	26	30
Insiza South	Farm Lancaster	J. Campbell	...	...
Inyazura	Inyazura	W. P. Frudd	...	1
Lalapansi	Lalapansi	A. Watt	12	9
Lomagundi	Sinoia	F. W. Robertson	11	...
Lomagundi West	Various farms	A. A. Bisset	13	10
Macheke	Various farms	R. O. Jackson	...	

Macheke Valley (Headlands) Farmers' and Tobacco Growers' Association	Various Farms	T. R. Colam	5	2
Makwiro	Makwiro	W. L. Parsons	18	15
Marandellas	Marandellas Farmers' Hall	E. Cruikshank	4	1
Marandellas, Southern	Various farms	B. V. Cherry	2	6
Mashonaland	Mashonaland Farmers' Hall, Salisbury	P. Wilson	11	8
Matobo South	Farmers' Hall, Malundi Farm	A. G. Allan	19	16
Matopo Branch, R.L. and F.A.	Farmers' Hall, Malundi	W. Mirtle	19	16
Mazoe (Concession)	Various farms	Douglas Southey	11	8
Mazoe (Glendale)	Farmers' Hall, Glendale	Mrs. A. G. McCall	9	13
Melsetter	Court House, Melsetter	Capt. E. H. Allott	12	9
Ngezi-Umniati	Harvieston, Enkeldoorn	Miss Harvie	26	30
North Melsetter	Various farms	P. F. de Bruyn	...	9
North Umniati	———	J. F. Eagar	Not	received
Norton and Lydiate District	Norton	A. Jones	4	1
Nyamandhlovu	Nyamandhlovu	R. D. McLean	...	...
Odzi District Farmers	Odzi Hotel	M. Goldberg	5	2
Poorte Valley	Various places	A. D. Wilson	19	16
Que Que	Offices of the Que Que Sanitary Board	A. A. Ackerman	19	16
Rusape Farmers' Association	Rusape	E. C. Harrington	5	2
Salisbury South	Various farms	P. Linton	30	27
Shamva	Shamva Court House	L. H. S. Paxton	18	15
Shamva North	Various farms	Mrs. E. J. Stevenson	19	16
Two Rivers Farming Association	Various farms	W. L. Parsons	19	16
Umboe (Branch of Lomagundi F.A.)	Various farms	G. T. Gover	12	9
Umvukwe Farmers' and Tobacco Growers' Association	Various ranches	Com. Wrightson	12	9
Umtali	Drill Hall, Umtali	A. Howat	3	7
Umvuma and District	Court House, Umvuma	S. T. Montgomery	18	15
Victoria	Victoria	G. E. Lamb	5	2
Wankie District	———	J. A. Halliday	Not	received
West Umvukwe Farmers' Association	Various farms	G. H. Gordon	5	2
Western	Plumtree Hotel	The Secretary	12	9
Willoughbys	Willoughbys	A. E. Roberts	Not	received

Farming Calendar.

July.

BEE-KEEPING.

The warmer bees are kept during this month so much the stronger will they come out in the spring. Provide a thickness of 3 inches of cloth coverings over the frames, and where quilts are, on examination, found to be damp, replace them with dry ones. This is a favourable season to carry out repairs to hives. All section and shallow frame combs must be carefully stored away from ants and mice, as these will be wanted for the excellent honey to be stored in them next October, collected from the bush bloom.

CITRUS FRUITS.

Mid-season oranges should be harvested and marketed this month; late varieties should be fit to export by the middle of the month. The dead wood should be broken and cut out of all harvested trees; this will minimise mechanical injury occurring with next season's fruit. Trees that are to be fumigated should have the lower lateral branches that touch the soil removed. Trim the trees until all foliage is just clear of the ground. The irrigation of late varieties must be continued and the cultivators kept going. Mark all trees when in fruit if the quality is bad; these may be cut back in August for top working to a good quality fruit. The soil of the early and mid-season varieties may be allowed to become fairly dry, for irrigation of the harvested trees may start an out-of-season growth which will enable pests to flourish and increase for the main spring blossoming flush.

CROPS.

Support agricultural shows, and add to your list of exhibits. Advertise your goods through the shows. Interested people will see them. If you require to make purchases of seed for next season, judge by the exhibits on the show what grower can best supply your needs, and place your orders accordingly. Attend the shows and go there to learn all you can about your business, not merely to have a good time. Seed maize previously selected in the field should be butted and tipped and hand shelled. Keep the butt and tip grain for check-row planting by hand. Do not over-irrigate winter crops, and do not irrigate when the wind is from the south, as this often means frost at this time of year. Troublesome weeds, such as darnel grass or drabok, may be removed from cereal crops by hand. Ploughing should be pressed on with, and maize stalks and roots of maize and other trash from the crop should be collected and burned very thoroughly. A land littered with unburnt and unrotted stalks and roots cannot be brought to a suitable tilth for planting and subsequent cultivation. Silage and sweet potatoes and other succulent feeds will have come into general use now, the potatoes being lifted from the land as required. The application of phosphatic fertilisers which are to be ploughed or harrowed in can be begun. Take the opportunity, during this and the next month or two, of inspecting all boundary and paddock fencing and gates, and effect repairs where required. Give a coat of paint to implements, wagons and carts. This protects the woodwork from rotting and the iron from rust.

DAIRYING.

This is one of the coldest months of the year, and milk production as a rule is low. Those cows which are being milked should receive a full winter ration of succulents (ensilage, pumpkins or majordas), hay and concentrates. Milking cows should either be under shelter at night or kraals should be sheltered against cold winds. The old adage, "Shelter is as good as a meal," should be remembered throughout the winter months.

No difficulty should be experienced in producing first-grade cream at this time. In cold, windy weather due precautions should be taken to ensure that the milk when separated is not below 90 degrees.

Most cheese-makers cease their cheese-making operations at the end of the month, as the milk generally not only is scarce, but begins to be deficient in butter fat. Cheese in the store-room should be carefully watched, as cheese mite is likely to appear on old mature cheese. In order to prevent the undue drying out of the cheese, the floor of the cheese room should be sprayed with water from a watering can.

Butter-making is sometimes difficult because of the low temperature of the cream. The temperature should be raised by immersing the can in warm (not hot) water until churning temperature is attained.

DECIDUOUS FRUITS.

Pruning must be continued, and if possible completed this month. The planting of all varieties is best if done now. Add a liberal amount of water at planting time, then cultivate the basins. Sufficient moisture will be thus retained to keep the newly planted trees going until they start active growth. Repeat waterings when necessary. If trees arrive from the nurseryman in a dry and withered condition, immerse them in water for twelve or more hours until they regain turgidity; then plant. Running water is best. Keep cultivators going. It will be advisable to irrigate all trees towards the end of the month.

ENTOMOLOGICAL.

Cabbage Family.—Plants of this family suffer from cabbage louse and Bagrada bug during July.

Onions suffer from thrip. The transplants may be dipped as far as the roots in tobacco wash or paraffin emulsion to keep down the pest.

Fig.—The winter crop of fruit is liable to suffer from fig weevil. The infested fruit should be collected and destroyed. If this has been done regularly with the first crop, the second crop is not likely to suffer much.

Maize Beetle.—Infested lands to be thoroughly ploughed throughout the winter.

FLOWER GARDEN.

Seeds of most annuals, perennials, shrubs and ornamental trees may be sown. The pruning of roses should be attended to early. Dahlias and other summer-flowering bulbs should be taken up, divided and replanted. Sweet peas require attention and staking.

VEGETABLE GARDEN.

Sow turnips, beans, peas, onions, cabbage, beet, carrots, parsnips. radishes, lettuce and spinach.

FORESTRY.

Care should be taken to protect all plantations from fire by hoeing belts round them and burning any grass likely to be dangerous. Cuttings of various deciduous trees may be taken and struck in nurseries. Continue pricking out conifers into tins or beds. In preparation for early planting in case the season is favourable, limited sowings of tree seeds may be carried out. If labour is available, preparation of land for planting to be taken in hand.

GENERAL.

Veld fires must be watched for and arrangements made to combat them. The loss that may result and the penalties under the Herbage Preservation Ordinance are to be borne in mind. Fire guards should this month be burnt round all grazing which it is desired to preserve for use later on.

POULTRY.

With the cold weather that we generally have in July, the birds should have extra food, i.e., barley or maize, if the supply of eggs is to be continued. A mixture of stewed linseed and bran should be given to the birds, warm, the last thing before they go to roost. This gives them a little extra food during the long and cold hours of the night at this time of the year and maintains the body heat. A certain amount of shelter is also necessary to protect them from the cold winds. Grass wind breaks about 3 feet high on the windward side of the run are sufficient. Remember that no chickens should be hatched after August; those hatched later take much longer to develop than those hatched before August, and they are usually stunted, weakly and unprofitable. Each month the young stock should be gone through and graded; anything that does not promise to be good should be got rid of. As the hatching season draws to a close, the breeding stock, if not carefully watched and treated, will become run down, and infertile eggs and weak chicks will be the result. Watch the breeding stock carefully and handle them occasionally; if they feel thin and light or the flesh is not hard but flabby, give extra food and more scratching exercise. The male especially should be well looked after and given a meal on three or four days of each week by himself; in addition, he should have some raw meat as often as possible. Good hatching and strong, healthy chicks are wanted right up to the end.

Turkeys should now be in full lay. Never disturb the hens when they are sitting. They are very sensitive and nervous, and unless left mainly to themselves, are apt to desert the eggs or break them. It is recommended that turkey chicks be reared by hand; the hens are poor mothers, they are clumsy, drag their chicks all over the place, and do not feed them as well as an ordinary hen does. The main thing is to keep the young turkeys warm, give them plenty of fresh air, thick separated milk and chopped onions or onion tops.

STOCK.

Cattle.—On ranches the advice given for June applies still. The bulls may again be put into the herd at the end of the month. If grazing has been reserved for the winter months, it will probably be wise to turn the cattle into it now. Watch for any unthrifty cattle, and get them into the home paddock and feed them before they become really poor.

Sheep.—Vleis should now be fairly dry and may be utilised; otherwise the advice given for June applies.

VETERINARY.

Horse-sickness and blue tongue should now have disappeared. Redwater and gallsickness occur all the year round, but the worst time is during the summer, when ticks are prevalent. Sheep may be inoculated against blue tongue now. Scab in sheep will probably be in evidence this month.

WEATHER.

Though rains have fallen during every month of the year in Rhodesia, none is looked for or desired this month. Most stations record an average of .01 to .3 inch over a number of years. Severe cold is likely to occur at this time of year, the lowest temperatures occurring an hour or two before sunrise. Frosts may be looked for, especially on calm clear nights. Cold windy days and damp "guti" weather tell severely on cattle, if shelter and food are not provided.

August.

BEE-KEEPING.

This month is one of inaction as far as the apiarist is concerned and the hive inmates are best left alone, except that once a week a corner of the quilt on the top crate may be lifted to see if the wax moth has gained a footing, as may easily be the case in a colony weakened by death from sundry causes, and in which case all such frames should at once be removed. Towards the end of the month, with warmer weather, the bees will be tempted out for play spells, cleansing flights, etc., and, according to the season, entrance stops may be opened out slightly with advantage.

In the workshop see that a spare hive or two are in readiness, well painted and ready for use at any hour; also have in readiness any requisite spares, and see that all appliances, such as veil, smoker, fuel, etc., are handy, for swarms may now go and come at a few minutes' notice. Where the bees have been left to their winter quarters with a fair supply of food, good results can confidently be looked forward to for the coming honey flow of the early winter weeks.

CITRUS FRUITS.

The first or spring growth should commence about the middle of the month, and the trees should have a good soaking of water when the new growth commences. If Washington Navel oranges are to set their main crop, frequent irrigations must take place from the time of blossoming up to the rainy season. These irrigations create the necessary humid conditions which are so essential to secure a satisfactory setting of this orange. It is advisable to stimulate the growth of unthrifty trees with an application of one to one and a half pounds of nitrate of soda when the first irrigation is given, this application of fertiliser to be followed by good cultivation. The amount of fertiliser recommended is for mature trees. The packing of late varieties will continue throughout the month. No bearing trees should suffer for want of moisture. Irrigation should not take place immediately before the harvesting of export fruit—at least ten days should elapse between irrigation and the harvesting. This is the best month to cut down citrus trees for re-working to better varieties. As the citrus trees are harvested, all dead, diseased and broken branches and shoots should be carefully cut out before the trees come into new growth.

CROPS.

If not already marketed, the main potato crop will probably be sold about now. Do not forget to grade the potatoes properly according to size. The buyer wants potatoes—table or seed—of even size, not large and small indiscriminately mixed. Select and clean farm-grown seeds ready for next season's planting. Label the bags with name and weight of contents. Build a proper shed for your seed potatoes on the lines recommended in the *Rhodesia Agricultural Journal*. Sort over seed potatoes in store and remove any diseased or rotten. Green oat or barley fodder on wet vleis, or under irrigation, will become ready for cutting. Press on with ploughing and cross-ploughing. Decide what crops are to be grown next season, and, if you think fit, discuss the matter with officers of the Department of Agriculture. If you have not already effected all your purchases, consider the question of what seed you will require to buy for next season, and discuss the matter with other farmers. If in doubt, consult the Department of Agriculture. In frost-free situations, potatoes can be planted for an early crop under irrigation or on damp land. Cart and spread your farmyard manure and plough it under as soon as spread to avoid loss. If you have any long stable manure, apply it to your heaviest

land. The application of phosphatic fertilisers to the land can continue. If you do not already have one, put up an implement shed, even if it be only poles and grass. Keep wagons and Scotch carts under a similar shed or in the shade of trees. Speed up the making and burning of bricks if this is still in progress.

DAIRYING.

At this time of the year the farmer should experience very little difficulty in producing cream of first-grade quality. As a rule the weather is sufficiently cold to prevent cream, produced under average conditions, from undergoing rapid deterioration, and it is not usually necessary, therefore, to separate a cream of such high butter fat content as is required during the warmer months of the year. During the winter months the separator should be adjusted so as to deliver cream testing 40 to 45 per cent. butter fat.

On exceptionally cold days care should be taken that the milk is not allowed to become too cold before separation—for efficient skimming, the milk should be separated immediately after milking and at a temperature not lower than 90 degrees F.

Farmers engaged in butter-making are usually successful in obtaining a good grain and firm body in butter at this season of the year. Cream can quite easily be cooled to churning temperature if placed outside the dairy and exposed to the atmosphere overnight. During cold weather, however, it is more frequently necessary to warm the cream for churning. The most satisfactory method of warming the cream to the proper churning temperature is to place the bucket or receptacle containing the cream in a tub or bath of water at a temperature of about 95 degrees F., stir the cream frequently and replace the water when cold.

This is usually a critical time of the year for young dairy stock. For dairy heifers, weaned calves, etc., there is possibly no better ration than one consisting of maize silage, legume hay and mixed concentrates, and these feeds, if supplied in liberal quantities, should serve to keep the young stock in a thrifty, growing condition.

DECIDUOUS FRUITS.

All plantings of deciduous trees should be completed by now, as the late planting of these trees is generally unsatisfactory. Pruning may be continued up to the middle of the month. It is advisable to water or irrigate all deciduous trees before blossoming; if possible, a second irrigation should be given after the trees have set their fruit. Follow up the irrigations with good cultivation.

ENTOMOLOGICAL.

Potato.—Early planted crops of potatoes may be attacked by caterpillars. The crops should be sprayed immediately with an arsenical wash.

Cabbage Family.—Young plants of this family should be kept sprayed with an arsenical wash to check attack by webworm. Do not spray plants of which the foliage is to be eaten within three weeks of use.

Onion.—May still be troubled with thrip. Use tobacco wash or paraffin emulsion.

Citrus Trees.—May be sprayed or fumigated against scale insects, having regard, however, to presence of fruit and blossom. Spraying and fumigating for scale should not be carried out whilst trees are in blossom. Clear young growth of aphis previous to blossoming, using nicotine, tobacco wash or Derris.

Guava.—Collect and destroy remnants of late crops to keep down citrus codling, especially if trees are in vicinity of citrus orchards.

FLOWER GARDEN.

Complete digging or forking over the soil as early as possible. Divide and replant dahlias, delphiniums, Shasta daisies, etc. Plant bulbs—tube-

rose, arum lilies and gladioli. Sow seeds of hardy annuals. Mulch newly-planted roses, shrubs, etc.

VEGETABLE GARDEN.

Plant out asparagus, cabbage, cauliflowers, onions and early potatoes. Sow seeds of tomato and other plants that are susceptible to frost in a sheltered position; also seeds of various vegetables and salads for summer use.

FORESTRY.

Cuttings of ornamental shrubs, roses, etc., struck in sand last month should be transplanted into good soil as soon as they show a good healthy growth of leaves. A large percentage of cuttings will damp off if left in sand longer than about six weeks. No manure should be added to the potting soil. Seed beds should be prepared and gum seeds sown if required for planting early in the season. If the trees are to be grown in seed beds only and not in tins, then gum seeds should not be sown until October, or later, as they will get too large.

GENERAL.

Fire guards should be completed and every precaution taken to guard against loss of grazing from fires. Natives commence ploughing their softer land this month, and for this reason, as well as because beer is plentiful at the kraals, local labour is apt to be scarce. At this time of the year, however, the need for boys on farms is not so severely felt as later on.

POULTRY.

By the end of this month all those who are not able to give much attention to the chicks while in the growing stage should have stopped hatching. Those who can give some extra care, can continue hatching for another month, but not later, for chicks hatched after August are usually slow in growth and weedy. They do not lay till some months after they should, and eggs are few in number; in fact, they are generally unprofitable.

Now that the hot weather is approaching, a constant war on insects must be carried out, and of these sand fleas and fowl ticks (erroneously called tampans) will be found to be the most troublesome. A bulletin on fowl ticks can be obtained upon application to the Poultry Experts, Department of Agriculture. Sand fleas, as most poultry keepers know, are found on the face, wattles, ear-lobes and combs of the birds. Application of carbolised vaseline will usually kill them at once, or two or three applications of any ordinary grease on successive days are efficacious. More than this is, however, necessary, for the breeding quarters of these insects (and they multiply very rapidly) are in the dust on the floor of the house and that of the run.

The best preventive is a hard floor (preferably of concrete) with no cracks. If this is not possible, the floor and around the house should be treated every week in one of the following ways:—(1) Thorough soaking with a solution of one teacupful of Kerol, Jeyes, Hycol, Izal, or similar disinfectant to a paraffin tin of water, or (2) with a strong solution of salt and water, or (3) dusting over and raking into the soil a mixture of one part flowers of sulphur and two parts finely powdered lime.

Ducks.—See that the breeding ducks have plenty of water, and if possible also some to swim in. Keep young ducklings out of the hot sun, otherwise there will be many deaths. The same applies to geese and goslings.

Turkeys.—Young turkeys must be protected from cold at night, for this is fatal to them. Give them as much free range as possible, and do not allow them to run round the house or on the same ground as fowls do. Turkeys like clean ground; any that is tainted is very detrimental to them. Let them find most of their food in the bush.

STOCK.

Cattle.—On the early granite and sand veld probably the worst of winter is over so far as grazing is concerned, and a nice bite of green grass is appearing. Care should be taken where cattle are allowed to graze on the early burnt grass not to let them get too much at first. On red soil farms the haystack will still be required, and in all cases a certain amount of hay or ensilage should be held in reserve against the possibility of very late rains. The bulls may again be put back into the herds. Any very young calves should be kept near home, and dipping should be carefully attended to. In dairy herds on any soil whatever, feeding, housing and bedding cannot be relaxed. Cows in full milk will benefit by a ration of, say, 5 lbs. of maize (crushed and soaked), 30 lbs. to 40 lbs. of ensilage or pumpkin and 8 or 10 lbs. of hay. If it is possible to give, in addition to the above daily ration, 2 lbs. of peanuts, crushed with the shell, or linseed ground with maize, or oil cake, a very great benefit will be derived. Calves, especially young ones, must be carefully watched; they should not run too far, and are better inside, except when the weather is warm. It will pay to feed to them a little sweet hay, bean meal, linseed, peanuts or peanut cake and a small ration of green food.

Sheep.—Sheep should give little trouble at this time of the year, but on very dry veld a handful of mealies and a little hay or ensilage will materially assist ewes with young lambs.

TOBACCO.

The seed bed site should be cleared and well ploughed, preparatory to burning and sowing. The usual date of sowing the first beds is the 15th September. Bulletins covering every phase of tobacco culture can be had upon application to the Editor.

VETERINARY.

Redwater and gall-sickness occur all the year round, although these diseases are more prevalent during the summer months. A good many deaths occur this month, however, amongst imported stock. Vegetable poisoning will probably be in evidence. Sheep can be inoculated against blue tongue. Scab is a poverty winter disease.

WEATHER.

No rain is to be expected, and even on our eastern mountains the precipitation is trifling. Showers, however, do occasionally fall in places, but are of no consequence. The sun is often warm during the day, but the nights are apt to be cold, and grazing being scarce, food and shelter are necessary for the stock.

Notes from the "Gazette."

"*Gazette*" *Date.*	*Items.*
	AFRICAN COAST FEVER.
	Marandellas Native District.
23.5.30.	Government Notice No. 324 releases the following farms from all restrictions:—Hofstede, Heilrand, Woodstock, Landsdowne, Newcastle, the eastern portion of Nooigedacht, Randfontein, Vlei Plaats, Whittington and the eastern portion of Groenvlei.
	Mazoe.
13.6.30.	Government Notice No. 379 releases the southern portion of the farm Richlands and the farms Frogmore, Frogmore Extension, Brockley, Ireniedale, Longcroft (farms Nos. 46 and 32), Hillymead (farm No. 29), farms Nos. 28 and 27, Protea, farms Nos. 15, 18 and 19, Kilmer, Sketchley (farm No. 25), Craigengower, Ardura, farm No. 22, Hermiston and Axen (farms Nos. 21 and 30) and Roan Flats from all quarantine restrictions.
	TOBACCO SALE AND EXPORT CONTROL ACT, 1930.
13.6.30.	The regulations in connection with the Tobacco Control Board established in terms of Government Notice No. 366 are published as Government Notice No. 380.
	GAME AND FISH PRESERVATION ACT, 1929.
30.5.30.	Government Notice No. 337 prescribes the forms for licences issued in terms of section 7 of the above-mentioned Act.

Salisbury Experiment Station.

FOR SALE.

KUDZU VINE CROWNS.

A limited quantity of kudzu vine crowns are available for sale at the following rates:—

Large crowns	6d. each.
Small crowns	3d. each.

Prices are carriage free to any station or siding in Southern Rhodesia.

Purchasers are recommended not to plant small crowns, except on land which can be irrigated. Orders with remittances should be addressed to the Chief Agriculturist, Department of Agriculture, Salisbury.

Departmental Bulletins.

The following Bulletins, consisting of reprints of articles which have appeared in this Journal, are available for distribution free of charge to applicants in Southern Rhodesia only. Outside Southern Rhodesia, 3d. per copy.

AGRICULTURE AND CROPS.

No. 174. Notes on Hop Growing, by H. G. Mundy, F.L.S.
No. 225. Napier Fodder or Elephant Grass, by J. A. T. Walters, B.A.
No. 278. New Crops for Rhodesia, by J. A. T. Walters, B.A.
No. 362. The Cultivation of Rice, by H. G. Mundy, F.L.S.
No. 403. Florida Beggar Weed, by H. G. Mundy, F.L.S.
No. 429. Propagation of Kudzu Vine, by H. C. Arnold.
No. 442. Swamp or Irrigation Rice, by K. V. Yoshi, Bombay.
No. 510. Check-row Planting of Maize, by H. G. Mundy, F.L.S.
No. 513. The Carob Bean in Rhodesia, by J. A. T. Walters, B.A.
No. 541. The Potato Crop under Irrigation, by G. R. Syfret.
No. 545. Artificial or Synthetic Farmyard Manure, by H. G. Mundy, Dip.Agric., F.L.S.
No. 550. Onion Growing under Irrigation, by C. Mainwaring.
No. 561. Wheat Growing in Rhodesia, by C. Mainwaring.
No. 568. The Treatment of Arable Land, by G. N. Blackshaw, O.B.E., B.Sc., F.I.C.
No. 581. Leguminous Crops for Stock and Soil Improvement in Southern Rhodesia, by C. Mainwaring, Agriculturist.
No. 590. Rye, by H. W. Hilliard, Junior Agriculturist.
No. 591. Maize Export Conference Proceedings.
No. 598. Drought-resistant and Early-maturing Crops for Areas of Late Rainfall, by C. Mainwaring.
No. 599. Rhodesian Soils and their Treatment, by E. V. Flack.
No. 601. Maize for Export, by S. D. Timson.
No. 603. The Production of Maize in Southern Rhodesia, by C. Mainwaring, Agriculturist.
No. 627. The Growing of Potatoes in Southern Rhodesia (Revised), by C. Mainwaring, Agriculturist.
No. 630. The Storage of Seed Potatoes, by H. C. Arnold.
No. 634. Barley, by P. V. Samuels.
No. 643. Noxious Weeds in Southern Rhodesia, by F. Eyles, Botanist.
No. 650. Coffee Culture in Southern Rhodesia, by G. W. Marshall, Horticulturist.
No. 651. Two Important Leguminous Crops: The Velvet Bean and Dolichos Bean, by C. Mainwaring, Agriculturist.
No. 656. Tractor Notes, by A. W. V. Crawley, M.E., F.G.S.
No. 657. Hay-making in Southern Rhodesia, by C. Mainwaring, Agriculturist.
No. 663. The Use of Fertilisers and Manures in Southern Rhodesia, by A. D. Husband, A.I.C., Chief Chemist.
No. 672. Hay-making in Rhodesia, by H. G. Mundy, Dip.Agric., F.L.S.
No. 674. Top Dressing of Maize against Stalk Borer, by H. C. Arnold.
No. 681. The Sunflower (Helianthus Annuus) (Revised), by S. D. Timson, M.C., Dip.Agric.
No. 684. Warning to Maize Growers: Maize for Export.
No. 685. Notes on Farm Practices at the Government Farm, Gwebi, by S. D. Timson, M.C., Dip.Agric.
No. 694. The Edible Canna (Canna Edulis), by D. E. McLoughlin.

No. 695. The Castor Oil Plant (Ricinus spp.), by S. D. Timson, M.C., Dip.Agric.
No. 697. Results of Analysis of Samples taken under the "Fertilisers, Farm Foods, Seeds and Pest Remedies Orrdinance" during the year 1927-28.
No. 700. Further Notes on Farm Practice at the Government Farm, Gwebi, by S. D. Timson, M.C., Dip.Agric.
No. 704. The Importance of Research on Pasture Improvement in Southern Rhodesia, by A. D. Husband, A.I.C., Chief Chemist.
No. 705. Suggested Cropping Programmes for Farms on the Sand Veld, by D. E. McLoughlin, Assistant Agriculturist.
No. 706. A Farmers' Calendar of Crop Sowings, by C. Mainwaring, Agriculturist.
No. 708. Witch Weed or Rooibloem (Striga Lutea)—a Serious Menace to Maize, by J. A. T. Walters, B.A., F.R.S.A., Agriculturist.
No. 709. Sand Veld Farming and its Possibilities, by E. D. Alvord, M.Sc. (Agr.).
No. 710. Monthly Reminders for the Farming Year, by the Division of the Chief Agriculturist.
No. 713. Ensilage, by J. A. T. Walters, B.A., Agriculturist.
No. 724. Ploughing by Tractor, by A. W. V. Crawley, M.E., F.G.S.
No. 727. Farmyard Manure, by A. P. Taylor, M.A., B.Sc., Agricultural Chemist.
No. 743. Sunn Hemp, by S. D. Timson, M.C., Dip.Agric.
No. 750. Cotton in Southern Rhodesia—Hints to Growers, by G. S. Cameron, Empire Cotton Growing Corporation.
No. 751. The Sweet Potato, by S. D. Timson, M.C., Dip.Agric. (Wye).
No. 757. Maize on the Sand Veld: Results at the Tobacco Experiment Station, Salisbury, by C. A. Kelsey-Harvey, Manager.
No. 758. Instructions for Taking Soil Samples. Issued by the Division of Chemistry.
No. 759. Witch Weed (Striga Lutea): Methods of Control, by S. D. Timson, M.C., Dip.Agric. (Wye).
No. 762. The Value of Rock Phosphate and "Bone and Superphosphate" as Fertilisers for Maize Production, by A. D. Husband, Chief Chemist.
No. 768. The Ground Nut (*Arachis hypogaea*), by S. D. Timson, M.C., Dip.Agric. (Wye).
No. 775. Agricultural Costings at the Gwebi Farm, by H. G. Mundy, Dip.Agric., F.L.S., Chief Agriculturist, and J. Hick, Accountant.
No. 776. Regulations Governing the Export of Maize and Maize Meal through the Port of Beira.
No. 777. Some Aspects of Cost of Production Studies in Agriculture, by Arthur G. Ruston, D.Sc., Department of Agriculture, Leeds University.
No. 781. Agricultural Costings at the Gwebi Farm—Maize and Green Manuring, by H. G. Mundy, Dip.Agric., F.L.S., Chief Agriculturist, and J. Hick, Accountant.
No. 783. Agricultural Costings at the Gwebi Farm—Fattening for Beef, by H. G. Mundy, Dip.Agric. (Wye), F.L.S., Chief Agriculturist.
No. 787. Agricultural Costings at the Gwebi Farm—Ground Nuts and Maize and Beans for Silage, by H. G. Mundy, Dip.Agric. (Wye), F.L.S., Chief Agriculturist.
Botanical Specimens for Identification.
Accelerating the Sprouting of Potatoes.

REPORTS ON CROP EXPERIMENTS.

No. 94. Second Report on Experiments, by J. H. Hampton.
No. 216. Manuring of Maize on Government Experiment Farm, Gwebi, by A. G. Holborow, F.I.C.
No. 220. Reports on Crop Experiments, Gwebi, 1914-15, by E. A. Nobbs, Ph.D., B.Sc.

No. 221. Results of Experiments, Longila, 1914-15, by J. Muirhead.
No. 239. Reports on Crop Experiments, Gwebi, 1915-16, by E. A. Nobbs, Ph.D., B.Sc.
No. 246. Reports on Crop Experiments, Gwebi, 1915-16, Part II., by E. A. Nobbs, Ph.D., B.Sc.
No. 268. Manuring Maize, Government Farm, Gwebi, by A. G. Holborow, F.I.C.
No. 279. Report on Crop Experiments, Gwebi, 1916-17, by E. A. Nobbs, Ph.D., B.Sc.
No. 341. Report on Crop Experiments, 1918-19, Gwebi Experiment Farm.
No. 342. Rotation Experiments, 1913-19, by H. G. Mundy, F.L.S., and J. A. T. Walters, B.A.
No. 382. Annual Report of Experiments, Experiment Station, Salisbury, 1919-20.
No. 405. Annual Report of Crop Experiments, 1920-21, Gwebi Experiment Farm, by H. G. Mundy, F.L.S., and J. H. Hampton.
No. 411. Annual Report of Experiments, 1920-21, Experiment Station, Salisbury. by H. G. Mundy. F.L.S.
No. 413. Arlington Sand Veld Experiment Station, First Report, by H. G. Mundy, F.L.S., and E. E. Wright.
No. 432. Bulawayo Municipal Experiment Station, First Report, by H. G. Mundy, F.L.S.
No. 433. Winter Cereal Experiments, 1921, by D. E. McLoughlin.
No. 437. Annual Report of Crop Experiments, Gwebi Experiment Farm, 1921-22, by H. G. Mundy, F.L.S.
No. 440. Annual Report of Experiments, 1921-22, Experiment Station, Salisbury, by H. G. Mundy, F.L.S.
No. 485. Annual Report of Experiments, 1922-23, Agricultural Experiment Station, Salisbury, by J. A. T. Walters, B.A.
No. 486. Bulawayo Experiment Station, Annual Report for Season 1922-23, by H. G. Mundy, F.L.S.
No. 514. Bulawayo Experiment Station Report, 1923-24, by H. G. Mundy, F.L.S.
No. 519. Annual Report of Experiments, 1923-24, Agricultural Experiment Station, Salisbury, by H. G. Mundy, Dip.Agric., F.L.S.
No. 537. Crop Rotations on the Gwebi Experiment Farm, 1923-24, by H. G. Mundy, Dip.Agric., F.L.S.
No. 564. A Maize Rotation Experiment, by A. R. Morkel.
No. 566. Bulawayo Experiment Station, Annual Report for Year 1924-25, by H. G. Mundy, Dip.Agric., F.L.S.
No. 608. Annual Report of Experiments, 1924-25, Agricultural Experiment Station, Salisbury, by H. G. Mundy, Dip.Agric., F.L.S.
No. 631. Bulawayo Experiment Station: Annual Report for Year 1925-26, by H. W. Hilliard.
No. 649. Annual Report of Experiments, 1925-26, Agricultural Experiment Station, Salisbury, by H. C. Arnold, Manager.
No. 675. Bulawayo Experiment Station—Annual Report for Year 1926-27, by D. E. McLoughlin.
No. 683. Annual Report of Experiments, 1926-27, Agricultural Experiment Station, Salisbury, by H. C. Arnold, Station Manager.
No. 688. Report, 1923-24—1926-27, Gwelo Municipal Demonstration Stations, by D. E. McLoughlin.
No. 716. Report, 1927-28, Gwelo Municipality Demonstration Stations, by S. D. Timson, M.C., Dip.Agric.
No. 745. Salisbury Agricultural Experiment Station Annual Report, 1927-28, by H. C. Arnold.
No. 767. Gwelo Municipal Demonstration Stations. Annual Report for the Season 1928-29, by D. E. McLoughlin.
No. 773. Bulawayo Municipal Demonstration Station: Report for the Seasons 1927-28 and 1928-29, by D. E. McLoughlin, Assistant Agriculturist.

TOBACCO.

No. 605. Flue-Curing Tobacco Barns, Bulking and Grading Sheds, by P. H. Haviland, B.Sc. (Eng.), Acting Government Irrigation Engineer.

No. 607. Tobacco Seed Beds, by D. D. Brown.

No. 615. The Culture of Virginia Tobacco in Southern Rhodesia—Field Management, by D. D. Brown.

No. 617. Dark Fire-Cured Tobacco, by E. M. Matthews, B.Sc., Tobacco Adviser. Fire-Curing Tobacco Barn, by the Tobacco Advisers.

No. 629. Notes on Flue Curing of Tobacco, by C. A. Kelsey Harvey.

No. 641. The Handling, Grading and Baling of Cured Virginia Tobacco, by D. D. Brown.

No. 644. Tobacco Baling Boxes, by B. G. Gundry, Irrigation Branch.

No. 653. The Care of Tobacco Seed Beds, by J. C. F. Hopkins, B.Sc. (Lond.), A.I.C.T.A. (Trinidad).

No. 661. Flue-Curing Tobacco Barns, 12 ft. x 12 ft. x 16 ft., by B. G. Gundry.

No. 665. Tobacco Pests of Rhodesia, by Rupert W. Jack, F.E.S., Chief Entomologist.

No. 671. Wildfire and Angular Spot of Tobacco, by J. C. F. Hopkins, B.Sc., A.I.C.T.A.

No. 679. Tobacco Culture in Southern Rhodesia: The Harvesting and Curing of Virginia Tobacco, by D. D. Brown.

No. 689. The Lesser Tobacco Wireworms, by Rupert W. Jack, F.E.S.

No. 715. Turkish Tobacco Culture in Southern Rhodesia, by D. D. Brown, Chief Tobacco Expert.

No. 718. Preliminary Experiments on the Control of White Mould of Tobacco, by J. C. F. Hopkins, B.Sc. (Lond.), A.I.C.T.A., Chief Botanist and Mycologist.

No. 728. Suggested Crop Rotations for Tobacco Growers, by D. D. Brown, Chief Tobacco Expert.

No. 734. Common Faults in Curing Virginia Bright Tobacco, by D. D. Brown, Tobacco and Cotton Expert.

No. 746. The Development of the Tobacco Industry in Southern Rhodesia. A Historical Survey, by D. D. Brown, Chief Tobacco Expert.

No. 748. Frog Eye Disease of Tobacco, by J. C. F. Hopkins, B.Sc.(Lond.), A.I.C.T.A., Chief Botanist and Mycologist.

No. 753. Leaf Spotting of Tobacco caused by Mosaic, by J. C. F. Hopkins, B.Sc. (Lond.), A.I.C.T.A., Chief Botanist and Mycologist.

No. 765. Seasonal Notes on Tobacco Culture in Southern Rhodesia, by D. D. Brown, Chief Tobacco Expert.

No. 771. Dark Fire-cured Tobacco: Field Operations, by D. D. Brown, Chief Tobacco Expert.

No. 774. Dark Fire-cured Tobacco: Harvesting and Curing, by D. D. Brown, Chief Tobacco Expert.

No. 784. Field Control of Frenching in Tobacco, by J. C. F. Hopkins, B.Sc.(Lond.), A.I.C.T.A., Plant Pathologist.

STATISTICS.

No. 196. Collection of Agricultural Statistics in Southern Rhodesia, by Eric A. Nobbs, Ph.D., B.Sc.

No. 209. The Agricultural Returns for 1914, by B. Haslewood, F.S.S.

No. 224. Statistical Returns of Crops in Southern Rhodesia for the Season 1914-15, by E. A. Nobbs, Ph.D., B.Sc., and B. Haslewood.

No. 230. Farm and Live Stock Statistics, 1915, by Eric A. Nobbs, Ph.D., B.Sc., and B. Haslewood, F.S.S.

No. 247. Statistical Returns of Crops Grown by Europeans in Southern Rhodesia for the Season 1915-16, by Eric A. Nobbs, Ph.D., B.Sc., and Fred Eyles, F.L.S.

No. 259. Statistics of Live Stock and Animal Produce, 1916, by Eric A. Nobbs, Ph.D., B.Sc., and F. Eyles, F.L.S.
No. 281. Statistics of Crops, 1916-17, by F. Eyles, F.L.S.
No. 286. Statistics of Live Stock and Animal Produce for the Year 1917, by Eric A. Nobbs, Ph.D., B.Sc., and F. Eyles, F.L.S.
No. 303. Statistics of Crops, 1917-18, by E. A. Nobbs, Ph.D., B.Sc., and F. Eyles, F.L.S.
No. 322. Statistics of Live Stock and Animal Produce, 1918, by F. Eyles, F.L.S.
No. 361. Statistics of Live Stock and Animal Produce for the Year 1919, by F. Eyles, F.L.S.
No. 380. Statistics of Crops Grown by Europeans in Southern Rhodesia, 1919-20, by H. C. K. Fynn.
No. 393. Statistics of Live Stock and Animal Produce for 1920, by H. C. K. Fynn.
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Meeting of Umvukwe Farmers' and Tobacco Growers' Association, 14th June, 1930.

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Editor - - *William E. Meade.*

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Editorial.

Contributions and correspondence regarding subjects affecting the farming industry of Southern Rhodesia are invited. All communications regarding these matters and advertisements should be addressed to:—The Editor, Department of Agriculture, Salisbury.

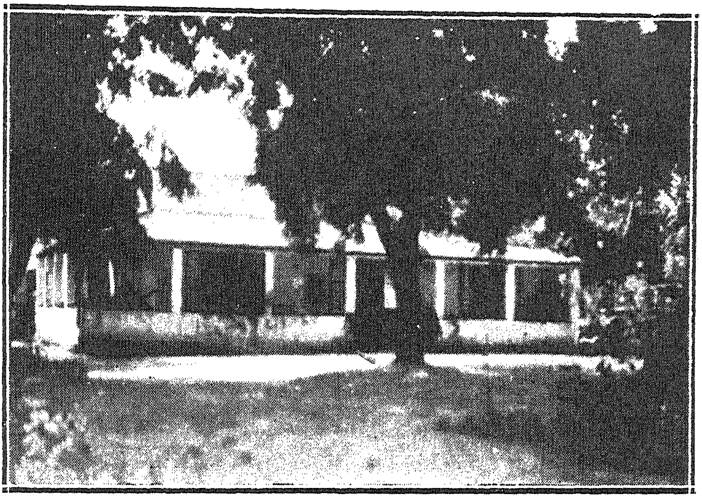
The Umvukwes Farmers and Tobacco Growers' Association.—The monthly meetings of this association are always well attended, and the members take a keen and live interest in all matters that pertain to the welfare of the farming industry. The meeting held on the 14th June at Frogmore was no exception to the rule, and in the group illustrated on the opposite page are some fifty odd persons, including a few visitors. The chairman of the association is Mr. J. H. Philp, of Horta Farm, who will be seen seated, and on his right is the Hon. J. W. Downie, Minister of Mines and Public Works, who attended the meeting. On the chairman's left is Mr. J. A. Edmonds, one of the earliest settlers in the district (he has now left the Umvukwes area), while on his left is Commander Wrightson, the honorary secretary of the association. The association has been in existence

since January, 1913, and the membership has grown from a very modest figure to 60 odd, although at one time it was over 80.

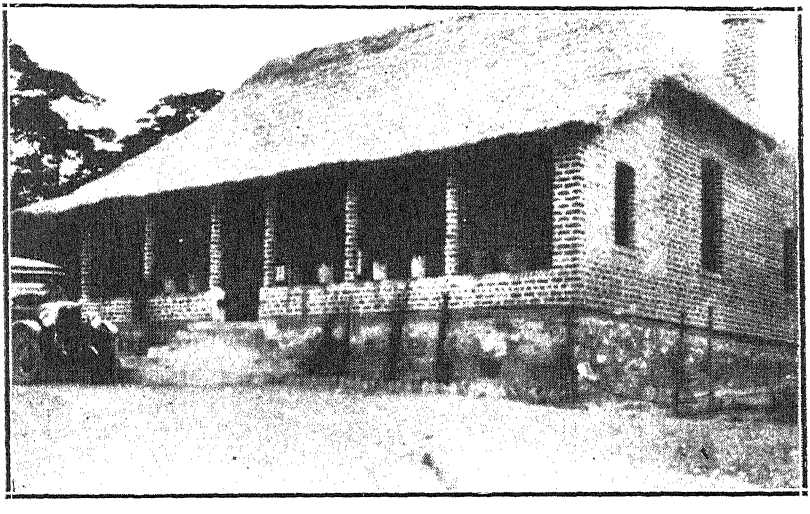
The Umvukwes district was surveyed originally as a ranching area, but with the popularising of tobacco, farms were sub-divided and an influx of settlers took place some six or seven years ago, so that to-day the district is fairly closely settled. Excellent crops of tobacco have been grown, even by beginners, and for a time substantial profits were made by a number of growers. Came the slump, and the Umvukwes farmers, in common with farmers elsewhere, are feeling the effects of depressed prices and limited demand for Rhodesian leaf. Large stocks of tobacco remain unsold and the future is by no means clear. Notwithstanding the difficult times now being experienced, very few settlers have left the district, and the Umvukwes farmers are facing their troubles like men and Rhodesians. They feel that there are better times in store. They are fortified by knowledge of the fact that they can grow tobacco of high quality and by the hope that the British public will some time—perhaps in the near future—recognise the merits of Rhodesian leaf and smoke it in preference to American. We sincerely hope they will. In the meanwhile the Umvukwes farmers are not sitting still waiting for times to improve. They are also growing maize, although this crop is now suffering from depressed prices, ground nuts, beans, and are turning their attention to dairying as well as to the raising of pigs for the bacon factory, fattening cattle for the local or Johannesburg market, and breeding poultry.

Some of the Umvukwes farms are situated a considerable distance from the railway, but the road motor service has solved the difficulties of transport, and maize is being brought in from a distance of 40 miles and more. This service was the corollary of the adoption by the Umvukwes farmers of the system of road councils, and the local body has done splendid work. Excellent roads now traverse the district, and with the bridging of rivers by the Government it is now possible to move freely from one end of the district to the other and to get to the railway and the capital in quick time.

The Umvukwes is of course the home and last resting place of "Gertrude Page," the Rhodesian novelist. She is



Homestead of Mr. and Mrs. H. K. Bracewell at Ruia Ranch, Umvukwe.



Homestead at Frogmore, Umvukwe, residence of Mr. and Mrs. R. F. Forrest.

buried at O'Meath, where some of her novels were written, and which is frequently referred to in her books. Her husband, Mr. G. A. Dobbin, is ranching on a considerable scale at O'Meath, while on the adjoining farm is her brother, Mr. J. A. Page, who is well known in the district.

A visit to the Umvukwes is a real pleasure, for it is an area of much charm. Its broad open spaces, picturesque scenery and exhilarating air appeal to the senses and make one feel that Rhodesia is a good place to live in. Although times are hard, conditions change very rapidly in this Colony, and the swing of the pendulum may come at any time to bring an era of prosperity to the farming community. May we suggest that the present would appear to be an appropriate time to overhaul our farming practice—to take stock of the position to see where economies and greater efficiency can be effected? Let us therefore ask ourselves a few questions. Are we getting the yields from our crops and the increase from our stock that we should? If not, what can be done to improve matters? Can we by better supervision or organisation get adequate results from our labour supply? Is it possible to improve our system of marketing? Can we co-operate more effectively? Are we growing the type of tobacco required by the manufacturers? We leave it to our readers to provide the answers. Farmers have been told to work harder, but the present is undoubtedly the time to think harder.

There is one more matter to which we would refer before concluding, and that is the necessity for afforestation in the Umvukwes district to make good the wastage caused by the cutting of the native timber for the curing of tobacco. There would appear to be a distinct danger of a timber famine in some parts, and we think farmers would be well advised to plant quick-growing species on an extensive scale without delay.

Payment of Maize Bounty.—As announced in the Legislative Assembly on the 25th April last, the Government has agreed to pay a bounty up to 1s. a bag on maize or maize meal exported overseas from Southern Rhodesia, provided that the total net price received by the exporter does not, including the amount of the bounty, exceed eleven

shillings and sixpence per bag. The provisions of this bounty apply during the period 1st April, 1930, to 31st March, 1931, only.

Application for payment of the bounty should be made to the Secretary, Department of Agriculture, and particulars should be given as follows:—Full name of applicant, postal address, number of bags exported, date of export from coast, name of steamer, total gross realisation price, total deductions, average net price per bag, amount of bounty claimed. Maize export certificates, bills of lading and premium receipts must be submitted in support of the claim.

A certificate signed by the exporter in the form of a solemn declaration that the total net proceeds did not exceed 11s. 6d. per bag will be required if account sales are not submitted, and the Government reserve the right to call for account sales, if considered desirable, at a later date.

Export of Live Cattle to England.—We have been afforded a sight of the account sales of ten head of cattle despatched from the Gwebi Farm to Liverpool with 168 head from various owners in this Colony per s.s. "Clan Mackenzie," which left Capetown in April last. The Gwebi consignment realised £286 15s. 8d. gross or 9½d. per lb. dead weight, from which must be deducted expenses in England amounting to £12 11s. 2d. and £133 16s. 3d. en route. The net amount realised was therefore £140 8s. 3d. To this must be added £26 15s., representing the bounty paid by this Government on cattle exported overseas, and a rebate of the railage from Southern Rhodesia to Capetown amounting to £13 7s. 11d., making the actual amount received £180 11s. 2d., or £18 1s. 1.4d. per head.

The ten Gwebi cattle weighed 12,840 lbs. when they left here, and, according to the account sales, killed at 7,245 lbs. What the live weight was when the cattle arrived in England we do not know, but the percentage of dead weight in England to live weight in Southern Rhodesia is .56.

The shipment of 168 head is made up (exclusive of Gwebi cattle) of 33 sent by Mr. D. Black, 37 by Mr. A. Miller, 30 by Mr. J. R. Stewart, 10 by Mr. A. Coles, 10 by

Mrs. J. Templeton, 10 by Mr. Smith, 8 by Mr. J. Todd and 20 by Mr. H. Taylor. We have not seen the account sales of these cattle, but the statement before us shows that the highest price was realised by the eight head sent by Mr. J. Todd, who, we understand, is farming in the Union of South Africa. These cattle realised £310 7s. 8d. after deducting expenses in England.

Of the Rhodesian cattle, the highest price realised was by the shipment sent by Mr. A. Coles. The net return on these was £183 19s. 7d., to which must be added the bounty and the rebate of railage, so that the actual amount realised will probably be over £20 per head.

We observe that on one shipment there is a loss of £54 17s. 2d. These cattle, we understand, were not stall fed.

Live Stock in England and Wales.—According to the agricultural statistics issued by the Ministry of Agriculture and Fisheries, there was again a reduction in the total number of cattle as compared with the preceding year, although the decrease was much less marked than that recorded in 1928. The total number of cattle returned as on agricultural holdings on 4th June, 1929, was 5,957,594, or 68,839 less than in 1928. The reduction in the total number of cattle was least marked in the dairy herd comprising cows and heifers in milk or in calf, which numbered 2,712,551, or 10,937 (.4 per cent.) less than in 1928. The number of cows and heifers in milk was reduced by 12,410 (.6 per cent.) to 2,054,073. Cows in calf numbered 293,715, which, compared with 1928, shows a reduction of 8,059 (2.7 per cent.). Heifers in calf increased in number to 364,763, a gain of 9,532 (2.7 per cent.). There was a much less marked reduction than that shown last year in the number of other cattle two years and over, which was 918,878, or 7,102 (.8 per cent.) less than in 1928. The number of calves returned on 4th June, 1929, was 1,102,254, showing a reduction of 17,643 or 1.6 per cent. from that of the previous year.

The total number of sheep on agricultural holdings on 4th June, 1929, was 16,105,453, a reduction of 294,157 (1.8 per cent.) as compared with the total of the preceding year.

This reduction is less than one-half of that shown in 1928. The substantial increase which brought the total number of pigs in 1928 within measurable distance of the record number of 1924 was followed in 1929 by the heaviest reduction recorded in any year since 1892. The total number of pigs returned in June, 1929, was 2,366,543, showing a reduction of 604,500 or 20 per cent. as compared with 1928.

Importation of Pedigree Live Stock from Great Britain.—Attention is directed to the notice published elsewhere in this issue of the Journal outlining the conditions under which the Government of this Colony and the Empire Marketing Board are prepared to pay the ocean freight and railage from Capetown to destination station in Southern Rhodesia on pedigree live stock imported from Great Britain. It will be seen that the scheme falls under two categories, viz.: class (a), whereby the Government, through the live stock loan fund, is prepared to grant financial assistance to approved applicants; and class (b), where no financial assistance is required by the applicant. In class (a) applicants are required to deposit 25 per cent. of the cost of the stock, the balance to be repaid within a period of four years, plus interest at the rate of 6 per cent. per annum. In class (b) the importer pays the vendor direct for the purchase price of the beast and reimburses the Government for all amounts incurred on incidental expenditure and insurance estimated at £40 per head.

All animals are insured on behalf of applicants in both classes from the time of entry into the quarantine station, in England, until arrival at destination station in Southern Rhodesia. The charge for insurance in transit is at the rate of £9 19s. 2d. per cent., and a rebate of £2 per cent. is allowed if no claim is made. Further insurance can be effected for a period of twelve months after arrival of the animal at the farm, but such insurance does not include death from redwater or gall-sickness. The fee for this insurance is £17 17s. 6d. for a bull and £19 15s. for a cow. If it is desired to include redwater and gall-sickness risk, insurance can be effected for £19 17s. 6d. for a bull and £21 15s. for a cow. In this instance the animals must be inoculated

against the diseases mentioned by the Director of Veterinary Research, but inoculation will only be undertaken provided the animals conform to certain requirements.

It should be noted that all animals imported under this scheme must be shipped prior to the 31st March, 1931, and that applications must reach the Secretary, Department of Agriculture, Salisbury, before the 30th September, 1930.

Empire Trade.—We have received from the British Empire Producers' Organisation a pamphlet bearing the title, "The Key to Empire Trade," in which the author, Mr. Harold T. Pooley, sketches the condition of Britain's Empire food supply and suggests possible methods of dealing with it in the future. The article contains a great deal of data of very considerable interest to the primary producer in the Empire, and *inter alia* shows that in 1928 Great Britain spent £532 millions on imported food, drink and tobacco. The principal food items in this amount were:—Meat (including animals), £109 millions; wheat, £57 millions; butter, £52 millions; tea, £35.8 millions; raw fruit, £33 millions; sugar, £27 millions; eggs, £17.76 millions; tobacco, £17.8 millions; cheese, £15 millions; raw vegetables, £13.4 millions; fish, £13.4 millions; flour, £6 millions; currants and raisins, £5.5 millions; coffee, £5 millions; condensed milk, £4 millions; raw cocoa, £3.8 millions. Over the five years 1923-27 the overseas Empire sent about 37 per cent. of all foodstuffs.

The writer analyses the position in regard to Empire supplies of certain of these commodities and emphasises the urgent necessity of a buying policy in Great Britain. The remedies he proposes are three in number, viz.: (1) The buyer's preference, founded upon patriotism and general economic arguments; (2) collective purchase and distribution of foodstuffs with stability of prices under Government or semi-official control; and (3) comprehensive preferential tariffs.

We gather from what is written that definite proposals under the foregoing heads will be submitted to the forthcoming Imperial Conference, which will be charged with decisions of vital importance to the Empire.

It is worthy of note that the Empire contribution of tobacco has grown from 1.01 per cent. of the total clearances for home consumption in 1919 to 16.62 per cent. in 1928. For the first quarter of 1929 Empire clearances were 18.2 per cent. and for the first half of the year 17.38 per cent. of the total. In analysing these figures the author states: "Naturally, it has not been a simple matter for the trade to absorb the whole of this astonishing increase, and the unexpectedly large extension of the Rhodesian crop has complicated the situation in 1928; but the process of digestion is going on steadily, and as long as a fair proportion of the preference is allowed to get to the producer, and he is not beaten down to the point of abandoning production, even larger percentages may be expected in the coming years without danger of damming up the retail outlet. It is to be noted that in any comparison of industrial prosperity the tobacco manufacturers are very easily at the head of the list, whereas the grower in the Dominions and Colonies sits precariously at the present time on that knife edge which divides profit from loss, and in some Colonies is definitely down on the side of loss."

In a general summing up of the position as it exists to-day the author states: "Enough has been said to show, in each of the different groups dealt with, the extraordinary chaotic condition of Britain's food supply. It is all very well to point out the gigantic smooth efficiency of Smithfield; the cheerful jumble, disguising ordered despatch, of Covent Garden; or the noisy and noisome promptitude of Billingsgate. The Port of London Authority may beam complacently over its royally entitled docks, where millions of tons appear and are dissipated in the manner of Aladdin. Order and method no doubt exist in the immediate feeding of the people of this over-crowded island; but when the lack of organisation of supply from its Empire origin and the absence of any far-seeing and embracing policy are considered, chaos is not too strong a word."

An Imperial Bureau of Animal Nutrition.—This bureau originated in the Imperial Agricultural Research Conference of 1927 and is the natural outcome of the post-war movement towards co-operation between the different Governments of

the Empire in the investigation of economic and biological problems of common interest.

The functions of the bureau are as follows:—

(1) The collection of information on research in animal nutrition and allied subjects in different parts of the Empire, and the compilation and maintenance of an index of this research.

(2) The collection of all available information from scientific literature and other sources bearing on problems of common interest and importance.

(3) The distribution of this information, in replies to queries, by circulated memoranda or by such means as may seem most suitable.

(4) In addition to this collection and distribution of information, the bureau may facilitate exchange of workers, especially by supplying information with regard to the centres between which exchange would be most profitable, and it may assist in arranging meetings of workers interested in the same problems.

The bureau does not carry out research, nor does it offer suggestions for new schemes of work or criticism of existing schemes. If, however, an opinion or criticism be asked on any subject, it may be given, and, with the consent of the enquirer, if the matter be of sufficient importance, the bureau will endeavour to get, through its official correspondents or otherwise, the advice of leading authorities on the subject, in whatever part of the Empire they may be. It will be seen that the bureau is essentially a clearing house for existing information, a centre through which a research worker or administrative officer can obtain information bearing on the problem on which he is engaged, and also, if he wishes, the constructive criticism of his colleagues in other parts of the Empire who are engaged on similar work.

The bureau came into being in April last year and is attached to the Rowett Institute of Aberdeen. The first work of the bureau was to get into touch with senior research workers and administrators both at Home and overseas who are interested in animal husbandry. A circular letter was issued describing the bureau and making a statement of the research work in progress or contemplated. Eighty replies

were received covering practically the whole of the Empire. The information contained in these replies is being arranged to form an index of research in animal nutrition for the Empire. This index when complete will be circulated to all official correspondents for their comments and suggestions with respect to the subjects which should be regarded as of greatest importance and common interest, and therefore those on which the bureau should concentrate attention.

In the meantime information is being collected on the relationship of diet to susceptibility to disease. In addition to this collection of information on a fundamental subject, papers dealing with feeding experiments on farm animals are being abstracted and arranged.

As a special piece of work a survey of the present position of animal husbandry within the Empire is being made. This survey will give for each Dominion, Colony and Protectorate such information as the number of each class of animals, the total production of milk, wool, carcases, eggs, etc., the exports and imports of these, the chief factors which favour or limit the development of the industry, and the main research activities.

In 1932 the Imperial Agricultural Research Conference will meet in Australia, when the work of the bureau will be reviewed to see whether the objects for which it was created are being achieved and whether the scope of its activities can be extended.

Road Motor Services.—It is not our practice to make use of our editorial columns for the purpose of drawing attention to advertisements which appear in this Journal, but we feel constrained to depart from this practice in regard to the road motor service. At several meetings of farmers' associations lately, questions have been asked concerning the rates for various commodities, and there appeared to be some dubiety on the matter. We would therefore draw attention to the full page advertisement which appears in the front part of the Journal wherein the rates for mileages from 20 to 160 are given for cream, tobacco (unmanufactured), maize, wheat, live sheep (loose) and live pigs (loose). The advertisement also contains a list of the points between which the services are in operation and the passenger fares.

The Utilisation of Wood in Southern Rhodesia.

FENCING.

By T. L. Wilkinson, M.Sc., B.Sc.F., District Forest Officer.

This is the first of a series of articles in which an endeavour will be made to demonstrate how a more complete utilisation of local timbers may be obtained.

In October, 1924, this subject was dealt with by Mr. J. S. Henkel, Forest Officer, in the *Rhodesia Agricultural Journal*, and the present article includes certain valuable facts given therein, the whole of the instructions for erecting a fence being culled from this source.

Fencing is one of the most important operations on a well conducted farm, and one which can be economically carried out if advantage is taken of the materials which occur naturally on almost every farm in the Colony. On some farms use has been made of local and plantation timbers, but in most instances there is considerable room for improvement in methods of utilisation and construction.

The lack of knowledge of species and their uses has been one of the greatest factors in retarding their wider use. It is thought by many that the majority of Rhodesian timbers, which are unfortunately readily attacked by borers and termites, are of little or no value. This supposition is correct if non-durable timbers are not treated by a preservative process prior to use. If, however, these timbers are treated by a cheap yet efficient method as outlined in the article on "The Utilisation of Wood," printed in the *Rhodesia Agricultural Journal* of January, 1930, they can compete more than favourably with imported substitutes.

The use of local timbers for fence posts, etc., can, therefore, if used in a correct manner, effect a considerable saving in carrying out fencing operations in this Colony.

Selection of Species.—This depends largely on the type of fence which it is desired to erect. If a wire fence using live poles which will grow into trees is desired, then the choice of species is limited; but on the other hand, if a wire fence with ordinary wooden poles (*vide* Fig. 1), or for smaller areas a palisade fence (*vide* Figs. 2 and 3) is desired, then the choice of species is only limited by the number of species which will grow to sufficient size in the Colony.

Fences in which live poles are used as posts may be constructed from any of the introduced species (*i.e.*, eucalypts, pines, cypresses, etc.) which are suited to any particular locality. Since, however, the best means of propagating these species is from seedlings, their use will be limited by the length of time which must elapse prior to their becoming of use as posts.

The following native species may be used by growing them from cuttings. The common (native) names vary with the district within which the trees are situated, but most natives will know them under one of the names in the subjoined list:—

Botanical Name.	Native Name.
Cussonia spp.	Mufenji, Muchaka.
Commiphora spp.	Minyela, Mucha, Chuwi, Chibobo, Sibobo, Kanidot.
Ekebergia sp.	Mutomo.
Erythrina spp.	Mutiti, Gombati, Murungu, Kaffirboom, Luckybean.
Ficus spp.	Mukuyu, Mapawa, Mushavi, Muvonde, Musita, Muchaba, Mutowetowe, Muchowana umQuina, Wild figs.
Kirkia acuminata	Mushamina, unVumela, Muvumira, M'tuva.
Lannea discolor	Mushamva, Mushamba, Mumbumbu, Muvumba.

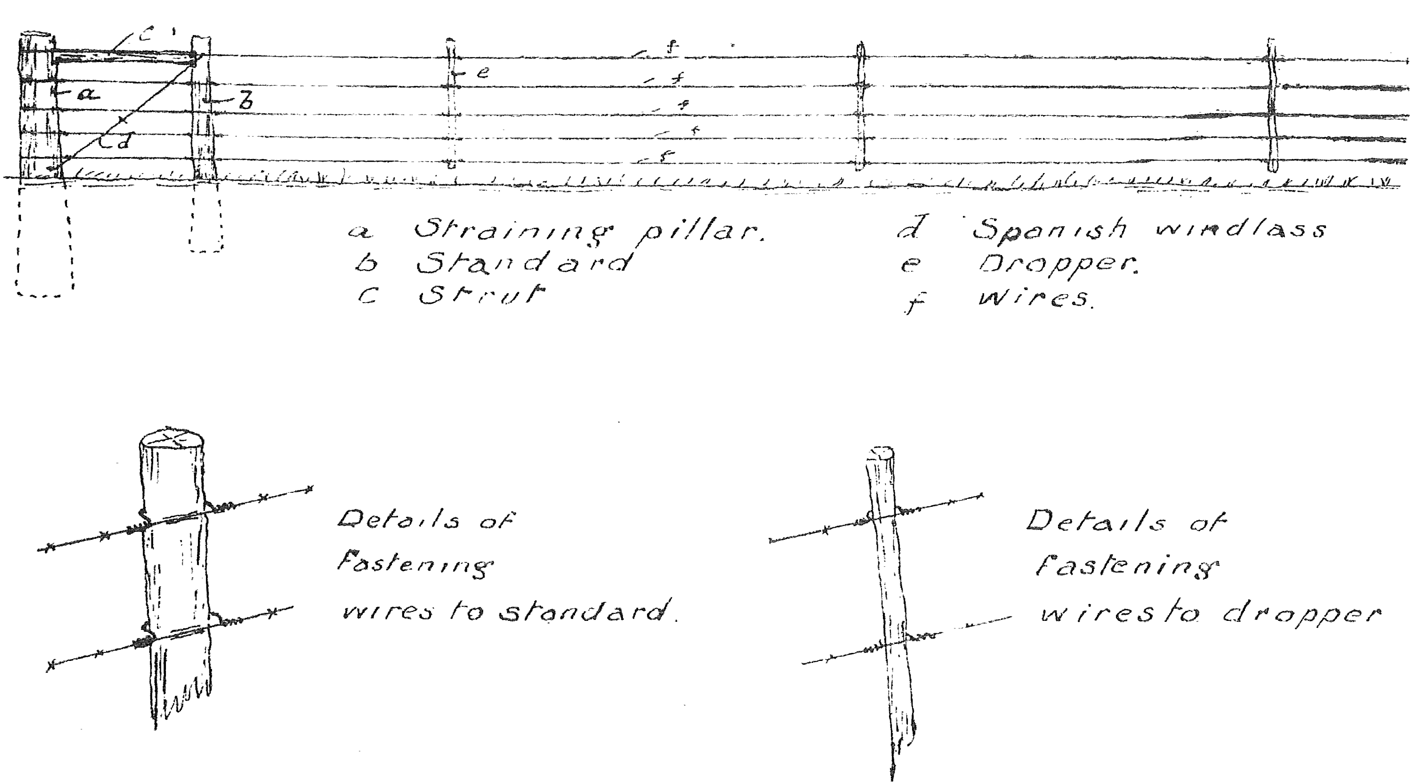


Fig. III.
Pole and wire fence.

Botanical Name.	Native Name.
Pterocarpus angolensis ...	Mukwa, Mubvamaropa, Mukurambira, umVagasi, Muvungamaropa, Muvamakova, Bloodwood, Kejaathout.
Rauwolfia sp.	Mukashu, M'kadhlwa, Muhwahwati.
Ricinodendron rautenanii ...	Mugongo, Ngoma, Ngomangoma.
Sclerocarya caffra	Muganu, Marula, Musoma, Mupfura, umGanu, Maukwakwa, Meroola.

Poles cut from trees and planted during the late winter months, *i.e.*, when growth is dormant, give the best results. Care should be taken to keep the bark intact. Poles should be set in square holes, subsequently filled in with good, well broken top soil to ensure best conditions for growth. Certain failures must always be expected, even under the best conditions, hence the fence should be kept under continuous observation and replacements made of failures until there are no blanks. In the foregoing instances a temporary fence of non-durable species may be erected to serve whilst the seedlings or truncheons are becoming established and growing to form the permanent fence. Fences of the type mentioned have the advantage of being comparatively free from fire injury.

In cases where, due to soil, climatic or other conditions, it is not possible or desirable to establish fences of growing poles, then posts cut from durable or non-durable subsequently treated timbers may be used. Any timbers which grow large enough to supply a post are suitable. The principal requirements of a good post are durability, reasonable straightness in at least one plane, and ability to hold staples, if these are used in fixing wires. If non-durable species are to be used, then their ability to take treatment must be considered.

The following is a list of the more common species having durable heartwood, and these may be used without treatment.

Botanical Name.	Native Name.
Acacia pallens	M'kai, Katagwa.
Acacia nigrescens	Knopjesdoorn.
Afrormosia angolensis	Muwanga, Chiwanga, Mbanga.
Albizzua sp.	Murianenze, Mugaranyeze.
Baikiæa plurijuga	M'kusi, umGusi, Redwood, Rhodesian teak.
Burkea Africana	Murarati, m'Nondo, Syringa.
Combretum spp.	M'chili, M'chenalota, Hartekal, Muyando.
Copiafera coleosperma	M'chini, Manzuri, Muzaoli, Rhodesian mahogany.
Copiafera mopane	Mopane, Mupani, Ipane, M'saro.
Diplorrhyncus mossambicensis	Mtoa.
Fauria saligna	umSatsati, Mutsetseti, Musesetu, M'pemberu, isiDwadwa, Musatsatsi, Mrere, Kafutsana, Gurahorgwe, Beukenhout.
Olea verrucosa	umGuma, Wild olive.
Parinarium mobola	M'hash, Muhatcha, Mumbhuni, Mujakata, umKuna, Mucha, Grysappel, Moura.
Pterocarpus angolensis ...	Mukwa, Mubvamaropa, umKurambira, umVagazi, Muvungamaropa, Muvamakova, Kejaat, Bloodwood.
Terminalia spp.	Mususu, Mangwe, Mukonono, Makonono.
Eucalyptus crebra	Narrow leaf iron bark.
Eucalyptus paniculata	Grey iron bark.
Eucalyptus rostrata	Red gum.
Eucalyptus sideroxylon ...	Red iron bark.
Eucalyptus tereticornis ...	Forest red gum.
Cedrela toona	Red cedar.

Unfortunately in most localities these durable species are either not abundant or have been cut out. Non-durable species occur throughout the Colony and are comparatively abundant on most farms when first taken up. On some farms plantations have been established, and the thinnings from these will form a good source of post supply.

Factors Affecting Durability.—Some species are naturally durable in the heartwood (*vide* list above); others are prone to attack by borers, termites or fungi, and are rapidly destroyed unless treated. If posts are to be set untreated, the more heartwood they contain the better. Consequently, split posts are generally more durable than round posts. If, however, treatment is to be given, round posts are preferable, as the sapwood can be more easily impregnated than the heartwood, and a continuous layer of preserved wood will then extend around the post.

The conditions of growth have a much larger effect than is generally realised. Posts cut from immature and fast-growing trees generally exhibit very little resistance to decay or attack.

Late summer and early autumn are the best seasons for felling trees. The timber dries more slowly and evenly, minimising splits and checks in which insects and fungi commence their destructive work. Insect attack is on the decrease.

Climatic conditions in this Colony are conducive to decay practically throughout the year, although all timber-destroying agencies are more active during the summer. The drier the locality the longer the life of the post as a rule.

Decay and insect attack are most active near the ground line, where the wood is continually damp through contact with the wet ground. In damp clayey ground attack extends only 2 to 3 feet below the surface and is usually near the surface line. In loose sandy soils where the air supply is better, attacks are usually below ground level and may extend to a depth of 5 to 6 feet. Any points where water is liable to collect are sources of infection, *i.e.*, uneven or rough tops, joints, etc.

The seasoning of posts which are not to be treated is a very questionable benefit, since the moisture content of the

portion of the posts below the ground must eventually come into equilibrium with that of the surrounding soil. By placing the post when green, splits and checks will be largely eliminated at the ground line, thus avoiding a condition favourable to decay. Of course, where a preservative treatment is to be given, seasoning is as a rule highly advisable, as better penetration is secured and the protective coating is less liable to injury due to subsequent checking. A simple and effective method of seasoning posts, poles, etc., is illustrated in the article "Utilisation of Wood," printed in the *Rhodesia Agricultural Journal* of November, 1929, and reprinted as Bulletin No. 763.

Since most of the wooden posts used in this Colony will be obtained from non-durable species it is proposed here to deal with cheap yet efficient methods of increasing their life. Posts which are to be set without preservative treatment should be peeled or barked. The bark allows moisture to collect, and thus makes conditions favourable to decay and termite attack. It also harbours wood-boring insects, which by boring tunnels may both seriously weaken the post and make conditions more favourable to rapid decay. Posts should be barked if they are to be seasoned and subsequently treated, since any bark left on the timber prevents the ingress of preservative solution.

The ends of posts should be cut with an axe or fine saw, especially if of a soft wood. The smooth cut enables rain to run off more freely and thus reduces liability to attack. Bevelling the top greatly assists run off of water and is therefore highly desirable since it increases the resistance to attack.

Setting Posts in Stones.—If stones are abundant, this method is better than setting the posts directly into the soil. The carting of stones from any distance does not pay, however, as the use of stones does not increase the life of posts materially. Its chief advantage lies in that it keeps weeds and vegetation away from the base of the post, thus prolonging its life and protecting the post from ground fires.

Setting Posts Upside Down.—This is done on the theory that rain water will run out of the post more readily in this position than when set large end down. There is no advantage in this, and were it not such a widespread belief it

would not be mentioned. The obvious objection is that, having the small end in the ground, the post is weakened where it requires most strength.

Charring the Butt is at the best a poor method, since its effectiveness is very slight. It increases the durability, but offset against this is the weakening of the post at the point where it requires most strength. If charring can be done very cheaply, then the operation will pay for itself through added durability.

Diagonal Holes filled with Preservative.—This method is not recommended, since it weakens the post and the solution does not diffuse through the post evenly. A modification of this, *i.e.*, "paste injection" (cobra process), may prove of value for treating green posts, but insufficient work has been done on this yet to state the results likely to be obtained.

Brush Treatments.—If posts, after having been seasoned, are given two or three coats of a good preservative, their life will be increased by a year or more. Either the entire post or the butt to a level of a foot above the ground should be treated. The solution can best be applied hot, and well worked in. When applied properly, the treatment will more than pay for itself.

Dipping Treatments are more effective than brush treatments, since the preservative has a chance of penetrating into all the cracks. The posts to be treated are simply dipped in a tank containing solution at 180 degrees F. for a few minutes and then removed. If advantage is taken of a cattle dip tank, which may be used for treatments, then the timber should be submerged for at least a week both prior to and after seasoning. This method is not advocated, however, since tanks which can be heated are so cheap and the results obtainable so infinitely superior. Normal dip solution is far too weak to be very effective. The penetration by mere immersion in a cold solution is not sufficient, and when the post is set in the ground the preservative readily leaches out, and after a year or so loses its value unless a subsequent dipping in hot, crude oil is given the post. Tar is not recommended for brush or dipping treatments on account of its inflammability and poor penetrating power. It does, however, warrant consideration

if brushed on after a treatment with a water-borne preservative, but it is considered that creosote or petroleum oil will give better results in this connection.

Impregnation Treatments are described with methods, preservatives and suitable plants in "Utilisation of Wood," the article which appeared in the *Rhodesia Agricultural Journal* of January, 1930, and reprinted as Bulletin No. 769.

Posts may be butt-treated or treated by total immersion. The former is usually sufficient for general purposes, the butts being treated to a height of one foot above the level at which they are to be set in the soil. The treatment recommended is to heat the posts in a preservative solution, maintaining the temperature at 180 degrees F. for one hour and either transferring them to a tank containing a cold solution or allowing them to cool for three to four hours or to 110 degrees F.

Solutions recommended are 1 to 2½ per cent. arsenite of soda, or 1 per cent. arsenious oxide and 3 per cent. zinc chloride, with or without subsequent immersion in petroleum oil, or 60 parts petroleum oil and 40 parts creosote. If seasoned timber is used, the results obtained will be better than if green timber is used. Green timber will take longer to treat and poorer results will be obtained, the penetration being less. Experiments are being carried out on the effectiveness of treating different species when green with various preservatives.

Cost of Treatment.—All timber may be treated by one of the above methods, whether it is to be used for straining posts, standards or droppers. Impregnation treatments where possible are strongly advocated, since the results obtained are infinitely superior to those obtained from all other treatments. The additional costs of treatment are more than compensated by the increased life given to the posts. The cost will vary with the species, size of post, method of treatment and type of preservative.

Standards 6 feet 6 inches long and 3 inches to 5 inches in diameter will cost for butt treatments only:—

Method of Treatment.	Per Post.
Brush treated creosote	9d. to 1s. 6d.
Brush treated petroleum oil	6d. to 1s. 0d.
Dipped, cattle dip arsenic solution	1d. to 0s. 2d.
Impregnated arsenical solution or zinc chloride	2d. to 0s. 6d.
Impregnated arsenical solution or zinc chloride, with subsequent dipping in hot oil	6d. to 1s. 0d.

Droppers 4 feet long by 1½ inches to 2 inches in diameter will cost one-fourth to one-fifth of above for full treatment.

Straining posts will cost four to eight times as much as standards, according to size.

The economy of treatment is discussed in the article, "Utilisation of Wood," which appeared in the *Rhodesia Agricultural Journal* of January, 1930. Actual records of durability are unfortunately not available for Rhodesia. In all other countries it has been clearly shown that efficient preservative treatment always pay, the life of non-durable timbers being increased five or six to even ten times or more.

Types of Fences.—Fences vary very widely in structure according to the requirements of the person concerned. They may take the form of hedges, dense wind breaks, wire fences attached to live poles or trees, pole and wire where the pole is of iron, wood or cement, pole and rail, picket or palisade, paling, etc. The most common and most widely used fence in this Colony is the wire, which consists of straining pillars, stays or struts, standards, droppers and plain or barbed wire, with the necessary baling wire, staples, etc. The requisite openings for ingress and egress should be supplied with gates or spars. The straining pillars, standards, stays or struts and droppers may be either of wood or iron. In some cases stone or ferro-concrete strainers, struts or standards are used. A fence may further consist of a combination of wood and iron, such, for example, as iron straining pillars with wooden standards and wood or iron droppers. The strength required and the purpose of the fence influences the choice of materials and the number of wires to be used. The material generally should be the best the farmer can afford.

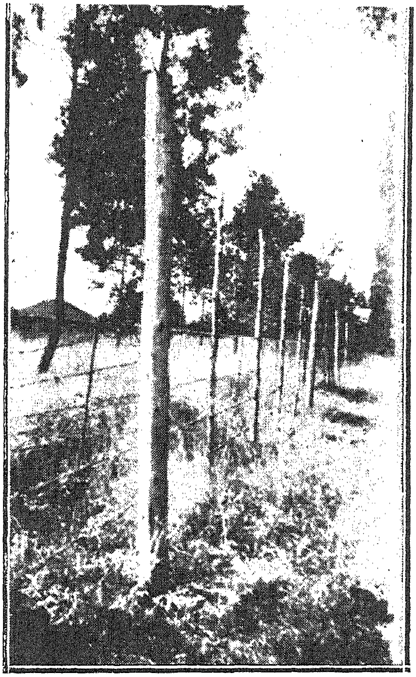
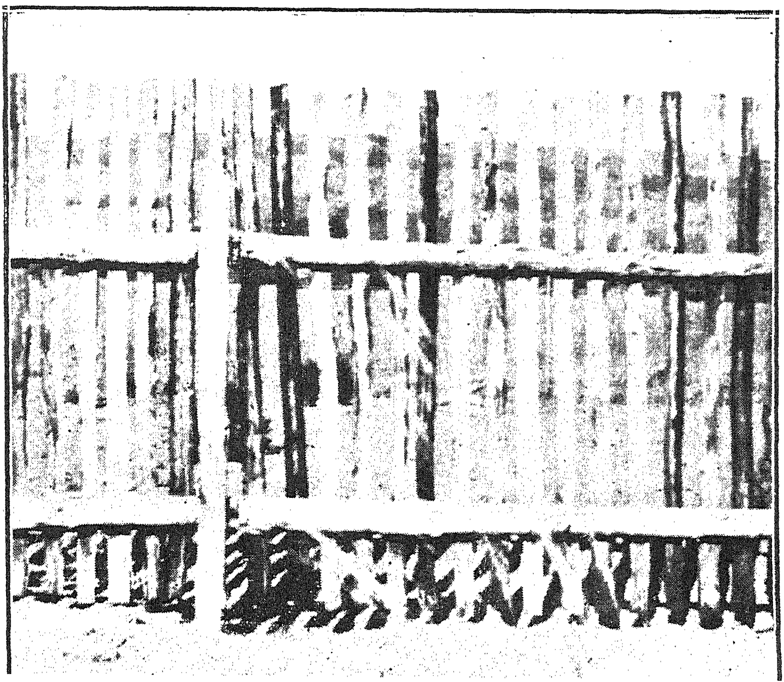


Fig. I.
Pole and wire fence.



conveniently large, say, 1 foot square, and filled with good top soil well beaten down, particularly round the base of the pole. Where other poles are used, they should be 6 feet 6 inches long, placed 2 feet in the ground, and well fixed with earth. The standards should be spaced in proper alignment not more than 44-feet centres, but if poles are abundant, they may be spaced at a less distance. This is desirable if heavy wooden droppers are to be used.

Droppers.—Droppers are intermediate uprights and hang upon the wires, and do not touch the ground. The droppers do not give any strength or stability to the fence, but merely keep the wires at their proper distances apart. They are not fixed until after the wires have been strained. The wooden droppers should average 1½ to 2 inches in diameter and should be 4 feet long. This permits of their being in line with the tops of the standards, and provides 6 inches of clearance from the ground level. A convenient espacement is 11-feet centres, but a closer spacing is permissible. Each dropper should be marked with a notch where each line of fencing crosses it, and should be neatly fixed to the fencing wires in the manner shown in Fig. 3.

Wires.—The spacing of the fencing wires is dependent on the farmer's requirements. The wire may either be plain or barbed, or partly plain and partly barbed. The spacing of the wires having been decided, steps should be taken to mark on the straining pillars and standards where the horizontal wires are to be spaced. A gauge or template should be used for the purpose. Where plain wire is used, holes may be bored through the straining pillars and standards, and the wire drawn through them. This, however, is an undesirable method and it is difficult to replace decayed, burnt or damaged poles. If holes are bored through the standards, a good plan is to pass pieces of plain No. 8 wire about 1 foot long through the holes, and, by means of this wire, draw the fencing wire against the pole, twisting the ends on the horizontal wire on each side of the pole. If holes are dispensed with, two notches are required on either side of the standard—one for the fencing wire and the other for the binding wire. The binding should be neatly performed by means of a turn-key or round-mouthed pliers, and the ends of the binding wire

neatly clipped. The binding may be dispensed with and staples used for the purpose of fixing the fencing wires to the standards. If staples are to be used they should not be driven home, but space left for the fencing wire to move through them. The fencing wires should be put on the side of the standards where it is known there will be most necessity for strength.

The fixing of the wires to the strainers is best accomplished by fastening one end of the wire to a straining pillar, commencing with the topmost wire. Unroll the wire until the next straining pillar is reached. Cut the wire to the length required and strain by means of a wire strainer to the necessary degree of tautness and securely tie round the straining pillar. Next bind or staple the wire to all the standards. When this is completed, fix the bottom wire in position in the same way and follow on with the intermediate ones.

Maintenance.—The fences should be kept under careful observation and repairs effected as soon as faults are noted. The chief injury is likely to occur from fires, which occur when heavy grass growth is permitted along the fence. The danger of any fire injury can be prevented by cultivating a narrow strip along both sides of the fence. This work should be undertaken in the summer. A cleared strip along the fence acts as a convenient fire guard where the necessity exists for burning fire belts to protect paddocks or plantations of young trees.

SHOW DATES.

Gatooma: 1st and 2nd August.

Rusape: 8th and 9th August.

Fort Victoria: 15th and 16th August.

Salisbury: 20th and 21st August.

Gwelo: 28th and 29th August.

Bulawayo: 3rd and 4th September.

The Feeding of Dairy Stock in Southern Rhodesia.

By T. HAMILTON, M.A., N.D.A., N.D.D., and
J. R. CORRY, B.Sc.(Agr.), Dairy Experts.

Owing to the great demand for information on this subject, it is thought desirable to reprint the following article which appeared in the Rhodesia Agricultural Journal *of June, 1927. In doing so we would specially draw attention to the great value of bean hay, ground nut hay and sunflowers as fodder crops for the feeding of dairy cattle during the dry months. The early publication of this article will enable farmers to make provision for these crops in their planting programme.*—Editor.

A new settler often experiences some difficulty in getting a dairy herd together, and he would be wise if he took time in the selection of his stock. He will in most cases find that he will get the best bargain if he chooses grade cows of a recognised milk breed. He should use judgment and choose only those cows which have plenty of capacity, and at the same time he should keep his eye on the milk vein and udder development.

Because an animal is pure-bred or pedigreed it is no guarantee that it will be a larger producer than a good grade. In fact, many grade cows beat pedigreed cows as regards milk production. Cows vary enormously as regards their ability to give a profit, as the settler will soon find out by experience, and although it is a mere platitude to say that one good cow is worth two bad ones, it should be remembered

that it is a very bad cow indeed which is not better than no cow at all.

Having got his dairy herd together, the settler should invest in a pure-bred bull whose ancestry comprises cows which have been outstanding as regards production both of milk and butter fat.

The settler, even before getting his herd together, should be certain that he can grow feed in plenty, and thus be in a position to feed his stock properly and maintain them in such a condition that they are able to do themselves justice.

Food is required for two reasons: (1) maintenance, and (2) production. Maintenance means the maintenance of life, the production of body heat and the performance of work. The amount of food required to carry on these functions without loss or gain of weight is called the maintenance ration.

The animal normal temperature of a cow is 100 degrees Fahrenheit, and it stands to reason that in cold or wet weather larger supplies of food are required to enable the animal to maintain this temperature. Unfortunately, it is during our cold season that our supplies of food are most limited and our days are shortest; the cows under normal conditions are kraaled early and turned out late. The necessity for the provision of winter feed for our dairy stock is not sufficiently realised, and often enough our milk cows in consequence are in a deplorably emaciated condition at the end of the winter, and from this state they hardly recover before another winter is upon them.

Composition of Food.—Food is composed of the following components:—

(a) Water.
(b) Protein.
(c) Carbohydrates.
(d) Fat.
(e) Crude fibre.
(f) Ash or mineral matter.

Water.—All food contains water in some proportion, either more or less, according to the variety of food. Bran, for example, contains approximately 10 per cent. moisture,

whilst majordas contain 95 per cent. Water is necessary to equalise body temperatures and to assist digestion processes. It is present in milk to almost 87 per cent. Water supplies must, therefore, be clean and unpolluted. A fair allowance should be made; at least 12 gallons per head per day should be provided, if dairy cows are to function as heavy producers.

Protein.—This is perhaps the most valuable component of food, and in Rhodesia its deficiency in our natural pastures compels the farmer to augment the ordinary food supplies by providing such additional feeds as monkey nuts, beans and legume hay, which are rich in protein. Protein forms lean flesh and is the chief component of milk. An ample supply of protein is most essential to young growing animals. For this reason nature provides that the "colostrum" or "beastings" should contain an excess of albumen in order to give the calf a good start in life.

It should be remembered that each gallon of normal milk contains 6¼ ozs. of protein, so that a cow giving three gallons of milk a day puts practically 1¼ lbs. of protein into the milk. At the same time it requires more than half a pound of protein for maintenance purposes; therefore a cow giving three gallons of milk per day requires almost 2 lbs. of protein per day. There is no other source from which the cow can get its protein except from the food fed to it. If the cow is a heavy milker and a deficiency of protein is present in its food, it will draw on its own body tissue and become abnormally thin and lean. Angularity and leanness, therefore, are features of most heavy milking cows, but it should be the dairyman's object to prevent undue leanness and emaciation by ensuring the provision of ample protein in the ration.

Protein has a further function of supplying energy, and in some cases manufactures fat, but feeding protein in excess is a wasteful procedure, because energy and fat can be derived from cheaper sources, e.g., from foods rich in starch and sugar. When more protein is fed than is needed to repair the tissues of the body, the surplus nitrogen is split off and excreted in the urine.

Carbohydrates.—These are utilised to give energy, to supply heat and to make fat. These, in the form of starch

and sugar, compose the bulk of our Rhodesian foodstuffs. The action of the digestive juices changes starch into sugar, and as such the carbohydrates are absorbed by the body.

Fats.—All foods contain a certain proportion of these—some more and some less. For instance, ground nuts contain as much as 40 per cent. and sunflower seed approximately 20 per cent. oil. If fed at all heavily, this proportion of oil is too great to be digested by calves and milking cows, but fattening and working oxen are able to digest this class of feed more readily. Fats are really condensed carbohydrates and are therefore more valuable, being estimated at 2¼ times the value of an equal weight of carbohydrates for heat and energy-producing purposes.

Crude Fibre.—In Rhodesia most of our bulky crops are very full of woody fibre, especially when the crop is ripe. For this reason hay should be cut early to avoid the excessive formation of the woody fibre, which is so largely indigestible. Although bulkiness of ration is of importance to the dairy cow, yet, of course, this can be overdone. The average cow cannot digest more than 70 to 80 lbs. of bulky material per day, and should more be fed, digestive troubles are bound to arise. Bulky foods such as maize silage are notoriously deficient in protein, and in order to obtain enough protein to produce 2½ gallons of milk it is calculated that the cow would be required to consume approximately 90 lbs. of ensilage, together with 90 lbs. of veld hay. This, of course, is an impossible feat. The feeding of maize ensilage is often considered sufficient for milk production, but, as will be shown later, this is erroneous, and although it may help to keep the cow in fair bodily condition, it is so deficient in protein that its use without the additional feeding of concentrates is hardly to be commended if milk production is aimed at.

Ash or Mineral Matter.—This Colony, Mashonaland particularly, is deficient as regards phosphates and lime, and the necessity of providing bone meal, together with salt, as a part of the daily mineral ration is urgent. It should be remembered that each gallon of milk contains ¼ oz. of chlorine and ½ oz. of phosphoric oxide, and that these can only be supplied in the form of salt and bone meal. A

lick composed of bone meal and salt is recommended. To this may be added a small quantity of kerol or other internal disinfectant. The following is the method of preparation:—Mix a paraffin tin three-quarters full of salt with one quarter tin of bone meal; slightly damp the mixture, and add half a whisky bottle full of kerol. Mix well and stir until the whole mass is of an even colour. This lick should be placed in a trough well protected from the weather.

If it is preferred that the bone meal should be given separately, a ration of one to two ounces sprinkled on the food in the manger is of extreme advantage to milking cows and growing stock.

Milk cows should get salt every day, as it is essential to keep them in a healthy condition.

Concentrate Ration when Cows are on Grass.—When grass is green and succulent it contains large quantities of water, and it is especially necessary to give extra feed in the form of either maize meal or cake at this time in order that the cows may produce their maximum yield at the cheapest rate. Extra ration—costing, perhaps, 1d. or 1½d. per day—will enable them to produce so much extra milk that the farmer will be repaid three-fold for his outlay. In Great Britain the practice of feeding cake and meal, even though the grass is at its best, is almost universal. If this is necessary on rich British pastures, it is doubly necessary on our (at times) somewhat sparse and unsatisfactory grazing.

The average sized Rhodesian cow cannot assimilate more than approximately 80 to 90 lbs. of grass per day, and if we analyse such a quantity of grass we find that there is a deficiency in the amount of dry matter necessary for a cow producing two to three gallons of milk. This deficiency must be made up by feeding extra meal or cake in the proportions given later in this article.

As with the case of any animal, it is easy to allow the dairy cow to lose condition, but it is a most tedious process to bring it back into condition again; and for that reason when the grass is going off the necessity of giving extra feed is at once apparent, so that the animal may come through the winter in such a condition that it will imme-

diately be able to make full use of the spring grass without wasting time in repairing and replacing body tissues.

Compounding Rations.—In compounding rations for any farm animal the following points should receive attention:—

(1) Quantity or bulk.
(2) Nutritive ratio.
(3) Palatability.
(4) Effect on the animal.
(5) Cost.

Quantity or Bulk.—A dairy cow, being a ruminant, requires a bulky ration, and its ability to transform large quantities of roughage of low protein content into a human food of high protein content makes it the most valuable animal on the farm. As has already been pointed out, however, the bulkiness of the ration has its limits, and it is obvious that if a cow is to produce milk it must be fed concentrates in addition to its bulky rations. A good rule to remember in compounding rations for dairy stock is that 3 lbs. of succulents should be fed per 100 lbs. live weight, together with 1 lb. of dry roughage (i.e., hay) per 100 lbs. live weight. Thus a cow weighing 800 lbs. should receive approximately 24 lbs. succulents, such as silage, and 8 lbs. hay, together with concentrates varying in weight according to the animal's milk production.

Nutritive Ratio.—In utilising our farm produce for feeds, considerable difficulty is often experienced in balancing up a ration, for the simple reason that most of our feeds are rich either in carbohydrates or oil. Ground nuts, sunflower seed and cotton seed, however, are rich in protein and are also rich in oil. If the oil is expressed, the residue known as "cake" or meal is comparatively rich in protein, and with the help of these cakes as meals very little difficulty is experienced in balancing up a ration so that the ratio between the digestible protein and the sum of the carbohydrates plus 2¼ times the fat approximates 1 to 6. Absolute mathematical exactness is not essential in compounding rations, but a ration with a narrower nutritive ratio than 1 to 5 is probably expensive, whilst a ration with a wider ratio than 1 to 8 is too carbonaceous to be used for feeding to dairy stock in milk.

Palatability.—It is extremely important that a ration should be palatable, as the palatability of the ration is an important factor in stimulating digestion and in inducing the animal to consume large quantities of food. Too often one finds mangers full of unpalatable feeds which are largely composed of woody fibre or which are mouldy. Whilst it should be one of the objects of the farmer to produce a good legume hay, yet often when such is fed to the cattle it is presented to them in such an unappetising way that they consume very little of it. By damping the dry hay with salt water and covering the next day's rations with wet sacks and allowing it to heat or ferment slightly, this bulky feed can be made so appetising that not a scrap will be left.

Variety of feed should not be overlooked. Monotony of diet is often a cause of lack of appetite, and especially with concentrates it is necessary to feed mixtures compounded of varieties of feeds. Sudden changes should be avoided, and this can be achieved if the feeds are mixed so that the substitution of one feed for another will not cause a material or marked change in the bulk of the ration which is to be fed.

Effect on the Animal.—It is conceivable that animals, like human beings, have their likes and dislikes. Where it is apparent that an animal is not thriving or has gone off its feed, it should be isolated and its rations gradually changed. Of course, unthriftiness may be due to other causes besides feed, but if kept under observation in a separate stall or loose box the reason for this unthriftiness can usually be discovered. The keeping of milk records is invaluable for ascertaining whether a cow is thriving or not, and feeding according to production can only be carried out if the milk is carefully weighed and records kept.

Cost.—This is a most important item. Every attempt should be made to feed farm produced foods only. As has already been explained, our farm produced foods are somewhat difficult to compound into a balanced ration unless ground nuts or cotton seed are treated so as to produce cake or meals. This should, as far as possible, be done.

Legumes should also be produced and either be put into the silage pit or made into hay.

If feeds are to be purchased they should, of course, be bought in the cheapest market and due attention be paid to the cost per unit. Bran, for instance, is a good feed, but its protein content is comparatively low. Its cost per unit of protein, therefore, is high when compared with the cost per unit of protein of ground nut cake or cotton seed cake.

When estimating the cost of a ration, due allowance must be made for the fact that maize, ground nuts and other feeds fed to cattle usually are below grade and that their commercial value is small. It is obviously unfair to charge full market prices for farm foods which it might be difficult to sell or on which transport charges would be excessive. In this connection it should be remembered that by feeding farm produce to the dairy cow we not only get a fair monetary return, but also maintain soil fertility.

Compounding Rations.—In the feeding of dairy cows there are many factors to be considered; some of these have been discussed under preceding headings, and it will be sufficient here to mention a few of the main considerations which should be studied if successful feeding is to be practised and the best results obtained.

Skill in feeding cows is measured very largely by the ability of the dairy farmer to apply such knowledge as has been found by experience and experiment to produce the best results, and the success or otherwise of any system of rationing depends in no small degree on the knowledge of the farmer concerning the fundamentals of correct feeding.

In order to practise an intelligent and profitable system of feeding it is essential that the dairyman should have a sound knowledge of the following:—

1. The requirements of a dairy cow.
2. The nature, composition and value of various feeds.

The Requirements of a Dairy Cow.—The general requirements of a dairy cow have been outlined in a previous article in this Journal, where it is shown that certain nutrients—protein, etc.—are required daily by the animal for maintenance and milk production. The actual quantities, however, of these nutrients required daily by dairy cows for

these two purposes can be ascertained fairly accurately by means of "feeding standards."

The following is one form of feeding standard, and is presented in order to indicate the approximate amounts of the various nutrients required daily by milking cows:—

FEEDING STANDARD FOR DAIRY COWS.*

Daily requirements.	Digestible crude protein. lb.	Total digestible nutrients. lbs.
For maintenance of 1,000-lb. cow ...	.70	7.925
For each lb. of 3 per cent. milk add	.052	.286
For each lb. of 3.5 per cent. milk add	.055	.316
For each lb. of 4 per cent. milk add	.06	.346
For each lb. of 4.5 per cent. milk add	.063	.376
For each lb. of 5 per cent. milk add	.067	.402

In the above table the requirements of the animal are expressed in terms of digestible protein and total digestible nutrients. The total digestible nutrients contained in any feed can be calculated by adding together the protein, carbohydrates and fat multiplied by $2\frac{1}{4}$. By means of this table it is possible to calculate the amount of protein, etc., required daily by any dairy cow, provided that her daily production of milk is known.

For example, the daily requirements of an 800-lb. cow producing two gallons of milk testing 3.5 per cent. butter fat are calculated as follows:—

A 1,000-lb. cow requires daily for maintenance:—

Digestible protein ... ... .70 lb.

Digestible nutrients ... ... 7.925 lbs.

An 800-lb. cow therefore requires daily for maintenance:—

1. Digestible protein ... ... $\frac{.70 \times 8}{10} = .56$ lb.

2. Digestible nutrients ... $\frac{7.925 \times 8}{10} = 6.34$ lbs.

In addition to this the 800-lb. cow requires .055 lb. of digestible protein and .316 lb. digestible nutrients for every

*Adapted from Modified Wolff-Lehmann Feeding Standards for Dairy Cows (Henry and Morrison, 17th edition).

pound of milk produced daily. The daily milk yield is two gallons (20 lbs.), and the extra amount of protein, etc., to be added to the maintenance allowance for this quantity of milk is therefore:—

1. Digestible protein ... ... $20 \times .055 = 1.10$ lbs.
2. Digestible nutrients ... $20 \times .316 = 6.32$ lbs.

The nutrient requirements of this cow can be tabulated as follows:—

800-lb. COW PRODUCING 20 lbs. OF 3.5 % MILK DAILY.

Daily requirements.	Digestible crude protein. lbs.	Total digestible nutrients. lbs.
For maintenance of 800-lb. cow	.56	6.34
For 20 lbs. (2 galls.) 3.5 per cent. milk	1.10	6.32
Total	1.66	12.66

This cow requires, therefore, rather more than 1½ lbs. of digestible protein and about 12½ lbs. of digestible nutrients daily to maintain her body and to produce two gallons of milk.

Nutritive Ratio.—As has been mentioned elsewhere, in a ration for a cow of this kind a certain balance should be maintained between the amount of digestible protein present and the carbohydrates and fat. This relation between the nutrients is known as the nutritive ratio, and in the above case, where the animal should receive 1.66 lbs. of digestible protein and 12.66 lbs. of digestible nutrients, the ration would have a nutritive ratio of 1 to 6.6. This is calculated as follows:—

$$\frac{\text{Digestible nutrients-Digestible protein}}{\text{Digestible protein}} = \frac{12.66\text{-}1.66}{1.66} = 6.6$$

The nutritive ratio therefore is 1 to 6.6. The nutritive ratio of any feed, the composition of which is expressed in terms of digestible protein and digestible nutrients, can be calculated in a similar manner.

On referring to the feeding standard presented it will be seen that to all intents and purposes the average cow requires daily about ¾ lb. of digestible protein and 8 lbs. of digestible nutrients for body maintenance, plus an addi-

tional ½ lb. of protein and 3 to 4 lbs. of digestible nutrients for every gallon of milk produced daily. If these figures are borne in mind they should suffice for practical purposes, and the average dairyman need not worry too much about feeding standards, which, after all, have their limitations and should be regarded chiefly as guides in feeding and compounding rations, to be supplemented by experience and good judgment.

Dry Matter.—The amount of dry matter required daily by a dairy cow varies considerably; a dry cow may receive about 15 lbs. daily, while twice this amount would hardly be sufficient for a cow producing five gallons of milk. As a rough guide to the amount of dry matter required, the following may be adopted:—

A 1,000-lb. cow requires about 20 lbs. of dry matter daily, plus an additional 2½ lbs. for every gallon of milk produced.

A 1,000-lb. cow producing three gallons of milk daily should receive, therefore, 20 + 7½ = 27½ lbs. of dry matter daily. As far as possible two-thirds of the dry matter contained in the ration should be supplied in the form of roughage and one-third as concentrates.

Mineral Matter.—It is hardly possible to over-estimate the importance of mineral matter in the diet of dairy stock in a country like Rhodesia, where the soils and natural pastures are generally deficient in bone-forming substances. Apart from the fact that mineral matter is essential for bone formation, milk production, etc., there is every reason for believing that an insufficiency of these substances in the ration of a cow is a possible cause of failure to breed regularly, and even sterility. For young growing stock, dairy heifers and milking cows bone meal is essential and should be fed in liberal quantities, as elsewhere described. It is frequently convenient and perhaps preferable to feed bone meal with the concentrate portion of the daily feed, and wherever possible this should be done, as the animals will then receive an allowance of mineral matter every day. Sterilised, finely-ground bone meal should be mixed at the rate of 3 to 5 lbs. for every 100 lbs. of grain. The necessity for providing salt and a supply of clean, cool water for drinking purposes has already been emphasised.

The Nature, Composition and Value of Feeds.—In planning rations for his dairy cows it is essential that the farmer should have a thorough knowledge as to the composition and feeding value of the various common foodstuffs.

The composition of the various crops commonly grown on Rhodesian farms can be ascertained from the "Analysis of Feeds" attached to this article. In this table the composition of the different foodstuffs is expressed in terms of digestible crude protein and total digestible nutrients to correspond with the terms in which the requirements of the animal are expressed in the feeding standard previously mentioned. The total dry matter contained in each feed and the nutritive ratio are also given. For example, the table of analysis shows that cotton seed has a nutritive ratio of 1 to 5, and contains in 100 lbs.:—

90.6 lbs. of dry matter.

14.5 lbs. of digestible crude protein.

89.2 lbs. of total digestible nutrients.

A further study of the table reveals the fact that the common cereal grains—maize, kaffir corn, oats, barley, etc.—contain very little protein. Leguminous seeds, on the other hand—cowpea, velvet bean, ground nuts—have a fairly high protein content, while by-products, such as ground nut cake, etc., are extremely rich in this nutrient.

Of the dry roughages, the leguminous hays appear to be the best sources of protein, while feeds such as veld hay, maize stover, etc., supply very small amounts of this nutrient.

The fresh green roughages and succulents in general have a low protein content, owing chiefly to the relatively large amounts of water that they contain. It should be remembered, however, that succulent feeds have a value not indicated by chemical analysis. These feeds are palatable, laxative, easily digested and stimulate milk production.

It will be noted also that feeds such as veld hay, maize stover, etc., have a very wide nutritive ratio. Legume hays, on the other hand, are far better balanced roughages and have a fairly narrow nutritive ratio. Cowpea hay, for instance, has a nutritive ratio of 1 to 4.8.

On studying the table the difference between roughages and concentrates becomes at once apparent. Roughages are bulky feeds supplying a relatively small amount of total digestible nutrients. Concentrates are less bulky, contain less fibre and furnish a greater proportion of total digestible nutrients.

The futility of attempting to provide a balanced ration for dairy cows from feeds such as veld hay, silage and maize meal is also apparent. A ration for a cow in milk should, as is stated elsewhere, have a nutritive ratio of about 1 to 6 or 1 to 7. Maize meal has a nutritive ratio of 1 to 11 and veld hay has a ratio of 1 to 29. It is manifestly impossible, therefore, to compound a ration from these feeds that would be suitable for a cow in milk.

The dairy farmer would be well advised to study these feeds and to make himself familiar with their general composition, feeding value, etc., and having this knowledge in mind he should then study the possibilities of his farm for the production of these crops, and plan his rotations so that from the crops grown on the farm, supplemented when necessary by purchased feeds, it will be possible to provide balanced rations for his stock at minimum expense.

Having a sound knowledge as to the value of the different feeds and the nutrient requirements of his dairy stock, the farmer is then in a position to compound suitable rations for his herd. Before proceeding to discuss the feeding of roughages, etc., it may be advisable to say a few words on economical feeding.

(To be continued.)

Pan-African Agricultural and Veterinary Conference, Pretoria.

AUGUST, 1929.

DISCUSSIONS CONCERNING GAME PRESERVATION, TRYPANOSOMIASIS AND TSETSE FLY.

By Rupert W. Jack, Chief Entomologist.

The important conference held at Pretoria in August last year and attended by official delegates representing agricultural and veterinary science in the various States of Africa, including Madagascar, has received little attention in the pages of this Journal pending receipt of the official reports of the proceedings. These have, however, now been received, and it is possible to summarise the discussions for the benefit of the readers of the *Rhodesia Agricultural Journal*.

It should be mentioned that a strong contingent of delegates from the Colony attended the conference and took a prominent part in the discussions.

Resolutions put forward by such a representative body of technical officers familiar with African conditions cannot fail to carry great weight and in certain instances to afford considerable enlightenment to those unfamiliar with the present stage of scientific knowledge in reference to the subjects discussed.

Amongst the subjects of particular interest to Southern Rhodesia discussed at the conference were the related questions of game preservation, trypanosomiasis and tsetse fly. The two last named were on the agenda of the veterinary section, and the former was discussed at a joint session of the agricultural and veterinary sections.

Whilst amongst the general community there are no doubt divergent views concerning the preservation of game, a singular unanimity of opinion was manifested amongst the veterinary and agricultural delegates to the conference resulting in a plainly worded resolution being passed without dissent.

Game preservation was considered firstly in relation to general stock problems, and secondly in relation to Glossinæ (tsetse flies). Dr. P. J. du Toit, Director of Veterinary Research, South African Union, was in the chair.

The discussion was initiated by Mr. H. E. Hornby, Veterinary Pathologist, Tanganyika Territory, who covered the ground so thoroughly that subsequent speakers found a difficulty in adding anything new to the discussion. Briefly, the attitude adopted by the various speakers was to the effect that, whilst æsthetic, humane and scientific considerations make it essential that all species of the existing fauna of Africa should be preserved, the menace to domestic stock and agricultural development created by the presence of large numbers of uncontrolled wild animals is such that it is impossible to justify the enforced preservation of these animals in occupied country.

Points emphasised in this connection included the capacity of these animals to act as hosts for ticks and other parasites, both external and internal, of domestic animals, and their role in reference to the spread of disease, special mention being made of rinderpest, anthrax, swine fever, tuberculosis and of the recently diagnosed disease of cattle, snotsiekte, which has been shown to be spread by wildebeest. Destruction of crops and injury to fencing were also referred to.

Several speakers dwelt particularly on the relation of game to tsetse fly and trypanosomiasis, and here again there was no conflict of opinion. Game is the chief, if not the exclusive, reservoir of the species of trypanosomes which cause "fly disease" in domestic stock. Game is the most important source of food to what were referred to as the "bush" tsetse flies, including *Glossina morsitans*, the species with which we have chiefly to deal in Southern Rhodesia, and *Glossina pallidipes*, which is probably the more impor-

tant to Southern Rhodesia of the two species which occur close to the Melsetter border in Portuguese territory.

Mr. Hornby's remarks in this connection may be quoted: "We have seen how detrimental to agriculture is the presence of much game, even in the absence of tsetse. Where these flies exist the presence of game takes on a grave significance, for there is no shadow of doubt that (a) game are important reservoirs of pathogenic trypanosomes, and (b) they are important sources of food to tsetse. These grounds alone would justify the reduction of game in settled areas in or near 'fly.' If, moreover, it were certain that extermination of game in a district would bring about the complete disappearance of tsetse in that area, then I would go further and say that this measure too, if practicable, is justified.

"That, I suppose, is the main question in connection with game and tsetse. Will extermination of game in a district bring about the complete disappearance of tsetse in that area? The answer is that it would probably bring about the complete disappearance of 'bush tsetses' like *Glossina morsitans* and *Glossina pallidipes* . . ." (but not of certain other species with which Southern Rhodesia is not concerned).

"There are large areas of Africa where only 'bush tsetses' are found, and I think that in certain parts of these areas game extermination is both justified and practicable. I shall go further and say that it is unlikely that tsetse destruction will ever be achieved without some measure of game destruction—and this raises another point.

"Ultimately tsetse must and will go. Now at present some of the greatest game reserves are in fly belt, and when the time comes for getting rid of tsetse in these reserves, their sanctuary must be violated, and so to my mind it is a great mistake to make game reserves in fly belts."

In the discussion which followed the various speakers were very much in agreement with Mr. Hornby, some additional points emphasised being (1) the desirability of distinguishing between harmful and non-harmful species of game, and (2) the necessity of adequate control of game reserves with a view to preventing over-stocking and migration.

Finally, the chairman (Dr. P. J. du Toit) asked the following gentlemen to constitute a small sub-committee to draw up a resolution to place before the congress, namely: Mr. Jack (Southern Rhodesia), Mr. Hornby (Tanganyika), Dr. Viljoen (Union of South Africa) and Mr. Carmichael (Uganda).

The following resolution was drawn up and was passed unanimously by the conference:—

RESOLUTION.

No. 3.

Game and its Relation to Stock Problems and Glossinæ.

This conference is of the opinion that:—

(1) The preservation of all existing species of African mammals, with the exception of those directly dangerous to man, is both desirable and necessary.

(2) The presence of game in settled areas, however, is a constant menace to stock, crops and general agricultural development. In this connection special emphasis must be laid on the relation of game to such epizootic diseases as rinderpest, and their capacity for acting as hosts to many endo- and ecto-parasites of domestic animals.

It is therefore uneconomical and unjustifiable to endeavour to enforce game preservation in such areas.

(3) Adequate and efficiently controlled reserves should therefore be established away from settled areas.

(4) Existing scientific evidence is now sufficient to justify the following conclusions:—

(a) Game constitute the most important reservoir of the trypanosomes pathogenic to domestic animals.

(b) Game constitute the most important source of food to the open forest tsetse flies, such as *Glossina morsitans* and *Glossina pallidipes*.

(c) The disappearance of these species may be expected to follow radical reduction of all game animals in any area.

(5) To ensure the perpetuity of game reserves and to prevent their constituting a menace to the surrounding districts, they should be free from Glossinæ, with a reasonable prospect of so remaining.

It is of particular interest to the inhabitants of this Colony to note how this resolution supports the policy which is being pursued by the Government. Whilst the intention of the game laws in this Colony is to delay the extermination of game in unoccupied country as long as possible, preservation of game in occupied country is not enforced, and on payment of the nominal fee for an "owner's game licence," any owner or occupier or European manager or servant of the owner or manager of any piece of land may destroy game animals, as well as ostriches, on such land at any time ("Game and Fish Preservation Act, 1929," section 7 (d)).

For practical purposes this leaves the decision concerning game preservation in occupied country in the hands of the owners of the land.

With regard to game reserves, the Government has moved in good time, and a large area has been set aside for this purpose. The establishment of game reserves in country infested with tsetse fly has also been studiously avoided. It is a little unfortunate that no really large area of land suitable for a game reserve was available outside the limits of the former occurrence of tsetse fly, but there appears to be a "reasonable prospect" of keeping the fly from re-invading the main game reserve in the Wankie district, the northern part of which is recorded as having been fly infested during the past century.

The resolution, of course, lends full support to the procedure of attempting to stay the advance of and to thrust back tsetse fly by means of intensive and controlled operations against game in defined areas.

The discussion in the veterinary section of trypanosomiasis and tsetse fly investigations was of particular interest, as it was one of the discussions attended by Major Walter Elliott, M.P., late Under Secretary of State for Scotland and former chairman of the Research Grant Committee of the Empire Marketing Board. Dr. Guy Marshall, Director of the Imperial Bureau of Entomology (Great Britain), was also present. Dr. P. J. du Toit was in the chair.

Mr. H. E. Hornby (Tanganyika) read a paper on "Trypanosomiasis," and was followed by Mr. Z. C. Bennett (Sudan) on the subject of "Camel Trypanosomiasis" in the

Sudan. Mr. R. W. Jack (Southern Rhodesia) then read a paper entitled "Some Aspects of the Tsetse Fly Problem in a Colony developing on the Basis of the European Settlement."

The ensuing discussion was devoted largely to measures against tsetse fly.

Dr. Marshall was specially requested to speak, and, after remarking that he had no actual experience with regard to attempts to attack the problem, stated: "In Rhodesia I realise they have a very difficult problem; it is impossible for them to tackle the control of flies along the same line as is being attempted in the Tanganyika country. There will be no royal road, I believe, to the eradication of the tsetse. Measures which will be useful for one species may be useless for another. In different areas the measures will have to be different. The question of the native policy will affect the distribution of fly eradication. There is another point which I think is not altogether realised by many Governments, namely, that the eradication of tsetse fly is going to be a very long, slow and expensive business. The hope of eradicating flies for any given area is extremely small."

Dr. Marshall proceeded to refer to closer settlement of natives as a method of clearing limited areas of forest and to the necessity of destruction of game in certain areas. He emphasised that destruction of game must be undertaken with great care and confined to the borders of the fly areas for fear of scattering both game and fly. With reference to the use of controlled grass fires, he expressed regret that the method had not given good results in Southern Rhodesia, and thought that if persisted in over a number of years the results might be better. He mentioned that at first results were considered unsatisfactory in Nigeria, but that their opinion had changed and they were now going to burn on a considerable scale. He was opposed to block clearance of forest, but thought that isolation of "islands" in the infested forest by suitable clearings might prove a useful measure. He emphasised the importance of control of motor traffic from the fly areas.

The chairman (Dr. P. J. du Toit) referred to the disappearance of the tsetse fly from the Transvaal during the

rinderpest epizootic of 1896, and its diminution previous to that year. He mentioned that at times they were seriously concerned with the possibility that the fly might again appear in the Transvaal.

Major Elliott spoke more directly to technical officers and the necessity for co-ordinating their ideas in a definite form for the guidance and information of their Governments. He suggested the formation of a representative sub-committee to draft a resolution and produce a summary of the important points revealed by the discussion.

Captain Smith (Northern Rhodesia) spoke as an administrative officer, and urged the necessity of the delegates going back to their various Governments with definitely formulated ideas. He expressed the opinion that closer settlement of natives would be very difficult to put into effect in Northern Rhodesia, and, whilst admitting the possibilities of game destruction, felt that such a measure could hardly be enforced in native territories. He referred to the big mining developments in his colony and the anticipated settlement dependent thereon, stating that the presence of tsetse fly in such a large proportion of the colony created very great difficulties. In conclusion he emphasised the importance of motor traffic in transporting flies.

Mr. Carmichael (Uganda) referred particularly to the importance of the so-called "mechanical transmission" of trypanosomiasis in areas free from tsetse fly and to the use of "smoke houses" to treat motor vehicles leaving the fly areas.

Dr. William Andrews (Great Britain) referred briefly to the work of the tsetse fly sub-committee of the Committee of Civil Research in Great Britain and the contribution which technical officers in the field could make towards a wider understanding of the problem.

Mr. R. A. S. Macdonald (Northern Rhodesia) referred to the reasonably successful use of antimony potassium tartrate (20 c.c. of a 4 per cent. solution in normal saline) as an injection for oxen working in a very densely infested fly area. "The inoculation was performed in the posterior or other auricular vein, and the ordinary transport riders soon became very proficient in the routine operation. To begin with, oxen were inoculated regularly once a week or once a

fortnight, but latterly they were permitted to work on for a month or longer until, when they began to lose condition again, a further inoculation became necessary. I have seen oxen which have been working hard and have been constantly inoculated as above for over four years." He referred to the importance of motor traffic, stating that he had seen such vehicles bearing literally hundreds of flies a distance of sixty miles from the nearest defined belt. In conclusion he emphasised the very great need for a simple and efficient sero-diagnostic test for trypanosomiasis in cattle.

Captain Bothelo (Mozambique) then presented a paper by one of his officers, Dr. Martenho, on the treatment of trypanosomiasis in cattle.

The chairman finally asked the following gentlemen to act as a sub-committee to draw up resolutions and a short summary of the main points of the discussion, namely, Mr. Hornby, Mr. Bennett, Colonel Turnbull (Northern Rhodesia, Professor Carpano (Egypt), Mr. Carmichael, Captain Henderson (Nigeria), Mr. Jack, Dr. van der Elst (Belgian Congo).

The following resolutions were in due course adopted:—

RESOLUTIONS.

Trypanosomiasis.

1. The *problem* of animal trypanosomiasis concerns every Government in Africa, though not equally; its importance being greatest in the centre, and diminishing towards the north and south. It is too big to be considered as a whole, and so must be divided into component parts which can be considered separately. A convenient method of division is as follows:—

- Animal Trypanosomiasis
  - Trypanosomiasis associated with tsetse, *T. brucei, vivax, congolense,* etc.
    - Prevention
      - Transmission
        - Tsetse.
        - Other means.
      - Prophylactic therapy.
      - Immunisation.
    - Cure
      - Diagnosis.
      - Curative therapy.
  - Trypanosomiasis independent of tsetse, *T. evansi, T. equiperdum.*

2. An important and gratifying conclusion derived from the papers submitted by the delegates from Egypt and Sudan is that the knowledge necessary for dealing satisfactorily with *T. evansi* (Surar) is now sufficient. As we know, also, that *T. equiperdum* (Dourine) has been dealt with successfully by other countries, *e.g.*, Canada, we need not dwell further on that branch of animal trypanosomiasis which is unconnected with tsetse.

3. The other great branch can be dealt with under the headings of:—

(a) Tsetse.
(b) Other means of transmission.
(c) Prophylactic therapy.
(d) Immunisation.
(e) Diagnosis.
(f) Curative therapy.

4. *Tsetse.*—There is no doubt that local control of tsetse is the greatest single step that can be taken towards suppressing trypanosomiasis in districts where these flies are found. To be able to achieve this it is necessary that fundamental research in the bionomics and ecology of the species of Glossinæ concerned should be continued and extended, the aim being to establish on a firm basis our knowledge of the re-action of these insects to environmental influences. We urge the necessity for providing for continuity in research along these lines, and consider that any provision made should cover a minimum period of five years. We also deem it necessary that the chain of research stations for this purpose should be extended with a view to studying the more important species under as wide a variety of conditions as possible. We thus support the scheme for tsetse research which was approved by the Entomological Conference in London in 1920.

While emphasising the need for research, we are not indifferent to the application of existing knowledge, and in our opinion much more might be done to check the spread along roads; even if only to compelling the traffic coming from fly belts to pass through "smudge houses" set in clearings.

5. *Other Methods of Transmission.*—The importance of so-called mechanical transmission is emphasised, but it is

realised that we lack knowledge of details concerning the relative importance of the different genera of blood-sucking flies in this connection, and that we are also ignorant of the part, if any, played by agents other than flies. We therefore commend this subject as worthy of more research, especially as results from such research can be applied immediately with great economic advantage.

6. *Prophylactic Therapy.*—It is realised that the drug Naganol confers a measure of protection against infection by the polymorphic trypanosomes, but we know of no drug which protects against infection by *T. congolense* or *T. vivax*. We can only emphasise how useful such an agent would be for the protection of cattle and other animals passing through a fly-belt.

7. *Immunisation.*—The existence of small herds and flocks in tsetse belts is reported from several countries, and at one time hopes were high that selective breeding would produce races of domestic animals possessing an immunity tolerance (premunition) towards all species of trypanosomes similar to that possessed by game. It would seem, however, that the ability of these small herds and flocks to live in their particular fly-belts is due to a limited immunity tolerance towards *local* strains of trypanosomes, and that even this is easily broken down by disease (*e.g.*, rinderpest) or other hardship. We fear, then, that what natural selection, working through a long period and with large numbers of animals, has failed to achieve will not be achieved easily by any method of artificial selection or of active immunisation in the ordinary immunological sense. While, therefore, we do not advocate abandonment of attempts to immunise strains, we do not think that useful results will be as readily attained by such attempts as by the expenditure of the same skill and energy on some other line of attack.

8. *Diagnosis.*—There is at the present time no sufficiently reliable method of diagnosis available for general use. It has, however, been demonstrated satisfactorily (by Robinson) that only the technical difficulty of preparing large quantities of antigen stands in the way of using the complement fixation test for the diagnosis of *T. congolense* and *T. vivax* infections. While stressing the fact that for general use some more simple diagnostic method is desir-

able, nevertheless the value of the complement fixation test is so great—even for checking more simple tests until a satisfactory simple one has been evolved—that we consider an effort should be made to overcome the technical difficulty referred to.

9. *Curative Therapy.*—That this branch of trypanosomiasis control is in a healthy state is evidenced by the valuable communications on the subject which have been presented to the conference. The undoubted and rapid advances which are being made show that this branch of work needs no encouragement beyond the stimulus which would be furnished by a better system of interchange of information among workers.

These resolutions were, of course, intended mainly for the benefit of technical officers and their Governments and are perhaps somewhat technical for the average reader.

It will be noted, however, that the necessity for research along certain defined lines is urged. The necessity for detailed research into the bionomics and ecology of the various species of tsetse fly concerned in transmitting trypanosomiasis is, of course, recognised by the Government of Southern Rhodesia, and it is hoped that the difficulties in reference to the establishment of a suitable research station will be overcome at a not too distant date. The emphasis laid on the importance of so-called "mechanical transmission," which in practice means the transmission of trypanosomiasis in the absence of tsetse fly, is of particular interest and without doubt further experimental work in reference to this question is highly desirable in this Colony.

It is encouraging to note that the conference was of opinion that curative therapy, that is the treatment of infected animals with a view to cure, was in a healthy state, and that undoubted and rapid advances are being made in this connection.

With reference to measures to be adopted for the eradication of tsetse fly, it may be mentioned that the method of controlled grass burning mentioned by Dr. Marshall has, according to the latest information, been abandoned in Nigeria after four years' trial, as the results obtained were judged insufficient to justify the expense and difficulties

associated with conservation of the grass. Two years' test in Southern Rhodesia also gave discouraging results, possibly attributable to the comparatively poor grass growth in the locality of the test. This area is, however, typical of the greater part of the fly country on the higher veld of the Lomagundi district.

Isolation of islands of infested forest by means of cleared belts is a measure which has received careful consideration in this Colony, but unfortunately in the areas in which action has been necessary no method of creating such clearings has presented itself other than direct clearing with paid labour, and calculation of the expense has produced prohibitive figures. It is also to be realised that in this Colony action has been forced upon the Government over much larger areas than have apparently been attacked with methods of grass burning and forest clearance in other parts of Africa. The operations between the mica fields and the Umvukwe hills in the Lomagundi district, including the supplementary operations in the Sipolilo sub-district, now involve an area of nearly a thousand square miles, the front being about sixty miles in length. In the Hartley district, with a front of about forty-five miles, the area at present enclosed and hunted is approximately six hundred square miles in extent. The new area to be fenced on the south-west corner of the Lomagundi district will add considerably to even these large figures.

It is apparent that in the present stage of development of the Colony, and bearing in mind the comparatively limited reserves available, only the least expensive of methods can be employed over the great areas involved. The Colony is less concerned at the present time with reclaiming ground from tsetse than with checking the continuous encroachment of the pest and protecting the settlers. The fly is quite capable of overrunning an additional ten miles or more of the country on a broad front in a single year if conditions are sufficiently favourable, and nowhere has it exhibited any tendency to retire of its own accord. In the face of such a menace, measures involving native settlement and forest clearance are too slow or limited in applicability to be of immediate value. However slow game reduction may be in eliminating tsetse from an infested area, experience to date is that it has

had a sufficiently early effect in arresting actual extension of the definite fly area.

Unfortunately, however, such arrest does not solve the whole problem in a district. Around the definitely infested country there is a zone of uncertain width over which occasional flies are more or less constantly ranging, and the highly susceptible cattle of the Colony tend to contract trypanosomiasis comparatively freely in such areas. It is these indefinite zones, in which tsetse flies are very difficult to find, which are causing the greater part of the trouble in the Colony at present. The aim has been to thrust back the limits of the definite fly area to a sufficient distance to place the occupied country beyond the range of this incursion, but full success has not yet been attained. There is, however, no reason to doubt that much agricultural country would by this time have been evacuated if the fly had been allowed to continue its former rapid advance in certain districts. The experience of the past thirty years is that advance of the fly does not cease of its own accord unless some natural barrier is encountered.

The unremitting pressure of the fly in the direction of regaining its former climatic limits can only be realised by those who have to deal with the position as a whole and have access to the recorded history of the fly in the Colony since the great shrinkage of the fly areas following the rinderpest epizootic in 1896. The writer of these notes has personal acquaintance with great areas of country, now heavily infested with fly, which he traversed freely with transport animals in former years. Year by year the limits of the fly-infested country on the official maps have had to be extended. It appears that nothing known to science at the present day will stay the advance of "fly" within the potential fly country wherever food and shelter—that is suitable living animals, including big game, and suitable forest—are sufficiently prevalent. Forest clearance cannot be utilised, at least as an immediate measure, to meet the position over the extended wide fronts involved. Grass fires, even if effective in heavily grassed areas, cannot be relied upon to check the advance over such extended tracts, involving very varied conditions, which include large areas of scanty grass.

Radical reduction of game is the only method known at present which can be applied over these great areas to meet the fast developing menace. If the fly can be held in check and caused eventually to fall back from occupied country by this means, so that the settlers are saved from ruin and farms from evacuation, a breathing space will at least have been obtained. This may allow of time for research to reveal other methods of control or possibly of the slow development of more or less permanent lines of defence, behind which the fly can eventually be driven.

The writer has purposely refrained from commenting on the discussion from any point of view other than entomological, but this must not be interpreted as indicating indifference to the claims of research from the veterinary and other aspects. It is obvious that discovery of methods of protecting domestic animals from infection by suitable treatment or of effecting a speedy and reliable cure of the disease would greatly modify the problem as it confronts the entomologist to-day. Moreover, the perfecting of tractors driven by cheap fuel available in the Colony would constitute a very great advance and assist greatly in the fight against the pest. The necessity for research into the problem from all standpoints is therefore clearly apparent.

Success in fighting trypanosomiasis in domestic stock in one way or another is vital to the healthy development of the Colony. It is unquestionably one of the most pressing problems with which the Colony is confronted at the present time.

Soil Erosion.

NOTES ON CONTOUR RIDGING.

By R. Hamilton Roberts, B.Sc. (Eng.), Assistant Irrigation Engineer.

Contour ridging has established itself beyond doubt as a successful means of combating erosion of cultivated lands, and several hundreds of miles' total length are in existence at the present moment in Southern Rhodesia. That this work has been carried out within a decade from the first propaganda on the subject reflects the greatest credit on the progressive type of Rhodesian farmer, who has in so many cases thoroughly appreciated the imperative necessity of protecting his main asset—the soil.

All the same, it would be unwise to be misled by the impressive phrase "several hundreds of miles," and it should be realised that this represents little more than the initial attack upon the evil of soil erosion which threatens practically every one of the 400,000 odd acres under summer crops alone. The land already protected is probably well under 15,000 acres, to which must be added the land which may be regarded as "partially protected" by storm water drains only.

Small as this percentage is, however, it still represents a very considerable amount of good work, and it is encouraging to realise that the interest taken in the problem is an increasing one. Two seasons ago the total number of visits to farms to advise on soil erosion was less than 60, while last year it went up to 124, and there is every indication that a new record may be set up in this current dry season, for with the busiest period still to come the number stands at the time of writing at over 60. Not only have the numbers

increased, but the scope of operation has been greatly extended by the waking of enthusiasm in districts widely separated from the Mazoe Valley, where the earliest work was undertaken. In passing, one may remark on the fact that a great deal more erosion takes place on so-called flat land than is generally realised, and is all the more dangerous for the insidious and almost invisible manner in which it occurs.

Most of the work of constructing contour ridges has in the past been carried out during the period between the time of shelling and planting the maize crop, as this makes for economical use of labour; but the system suffers from one defect, in that the soil a few inches below the surface is usually baked to the hardness of brick, which considerably adds to the difficulty and cost of other work. There is no doubt that it will often pay to take advantage of another period of the year when the farmer is again in the position of being compelled to look for work in order to keep his labour force employed, namely, about the month of March. By selecting the land where green manure crops have just been ploughed under, the soil will be found suitable to be easily worked up into contour ridges, thereby considerably reducing the cost. Another advantage is that the native labourers will find the excavation much less arduous, and increased "tasks" may be set without causing dissatisfaction. It is hoped that next season a greater number of farmers will take advantage of the "March tours" of advice which were inaugurated this year.

Cost of Ridging.—To the practical farmer this is naturally an item of intense interest, and special attention has been paid to it by the Irrigation Office. The chief point that emerges is that it pays handsomely to use an implement such as the "Martin" ditcher, providing that a certain minimum length of ridges has to be constructed. When hand labour is used exclusively the cost per yard of ridge usually averages about 2.0 pence, while with the ditcher and a certain amount of manual labour the cost is practically halved. The requisite minimum length of ridges to warrant the purchase of a ditcher is about 5 miles (corresponding to less than 200 acres), and obviously it will almost always pay two or three neighbouring farmers to share the cost and use of a ditcher. Under these conditions, and assuming that the ridges are eighty yards apart on the average, then the

cost per acre should not exceed 5s. When conditions are more severe the cost may be as much as 10s. per acre, but even at this figure contour ridging is definitely a business proposition, and one cannot over-emphasise this statement. The full significance of the increase in yield can only be appreciated by comparing the protected land with similar, but unridged, land after a few years' further unchecked erosion. In other words, even if contour ridging does no more than maintain fertility at a constant level, it represents a considerable gain in comparison with the barren state which is the ultimate fate of unprotected lands. But we know that it does more than this. As regards humus content alone there is already every indication that the loss is reduced to about one-third of the normal.

As a definite illustration of the cost of ridging it may be of interest to readers to reproduce the actual figures for ridges constructed last year on the farm Brinkburn, near Bindura. The total length of the ridges was 5,100 yards and the area covered was 100 acres. In many places serious gullies had been formed by previous erosion, and the cost of building timber "hurdles" to strengthen the ridges in crossing these gullies will be found included in the expenses. The initial work of throwing up the ridges was performed by a ditcher pulled by a tractor, and the ridges were subsequently "trimmed" by hand labour, each native being set to deal with 45 yards of ridge per day, which figure could probably have been considerably increased. The ridges were extremely well-constructed, and reflect the greatest credit on the owner of the farm.

	£	s.	d.
Paraffin: 5 cases at 16s. 6d.	£4	2	6
Wear and tear of tractor, say	4	2	6
Oil: 2½ gallons	0	15	0
Boy driving tractor: 2½ days at 1s. 6d. (say)	0	4	0
Three boys on ditcher for 2½ days	0	6	0
Trimming ridges: 45 yards per day at 9d.	4	10	0
Owner's supervision, 3 days at £1	3	0	0
Use of 20 shovels, say	0	10	0
Extra for hurdles at gullies	1	0	0
Engineer's fees	1	10	0
Total	£20	0	0

Cost per yard: 0.94 pence.

Cost per acre: 4s.

Difficulty of Working.—The farmer who has not yet had practical experience of working ridged land invariably raises this objection, but it is not difficult to demonstrate that the trouble is more imaginary than real. The testimony of the vast majority of farmers who have had contour ridges for a few seasons supports this statement. Apart from this consideration altogether, however, there is another answer to the argument: Surely it is better to contend with a system of contour ridges (be it ever so irregular) which is saving the soil than to be handicapped by an ever-spreading network of gullies, which are just as awkward and are robbing the land as well. One does not have to travel far, unfortunately, to be confronted with an example of this type of erosion, which has produced numerous channels too deep to be crossed and has compelled the farmer to plough up and down the lines of steepest slope, thereby accelerating the already too-rapid process of erosion.

What to Plant on the Ridges.—The existence of a contour ridge represents a certain loss of acreage. In point of fact, this area is small, since it requires nearly a mile of contour ridges to make up one acre, but nevertheless this acre will grow a wonderful stand of weeds unless steps are taken to make it produce a useful crop which will smother the weeds and yield a profit as well. Probably the best crop for the purpose is Sunn hemp, which may be sown broadcast and covered by a light harrow. This crop will smother weed growth and does not damage the ridges. An alternative, which is practised by Mr. G. Rattray, of Kingston, Bindura (a pioneer of contour ridges in Southern Rhodesia), is to hand plant maize on the ridges. The maize grows exceptionally well under these conditions.

Contour Ridging as an Aid against Pests.—This is an application of the use of contour ridges which is as welcome as it is unexpected. The seed of witch weed usually enters cultivated land by the agency of storm water flowing from infested veld, and is spread from one portion of a land to another by the water running through. The entry of the seed may be denied in the first case by the existence of an efficient storm drain, and the spread of the weed through the land, which is hardly less important, is controlled by contour ridges. Here again is an argument for the monetary

value of contour ridges, in that the eradication of the pest calls for less labour if it can only be localised and confined to definite portions of the land.

The army worm invasion was another case in point where contour ridges proved a help in time of need, for in several instances it was possible to localise the attack of the worm by defending the line of a contour ridge.

Conclusion.—These notes, written perhaps somewhat at random, are published with the object of voicing an appeal that farmers of this Colony should not rest upon their laurels, but should rather make every effort to press ahead with the urgent work of protecting the soil against erosion. It is particularly encouraging to be able to state that this year, in spite of the widespread agricultural depression, there is no apparent slackening or diminution of enthusiasm, and that there is every likelihood of at least the same amount of protection work being undertaken as in the previous year. Southern Rhodesia has every reason for pride in the start which has been made in the campaign against soil erosion, but at the same time the results achieved so far represent a very small percentage of the cultivated areas, and there remains a huge work still to be done. The longer it is delayed, the more expensive and difficult the task becomes. The best plan is to start at once and deal with a definite acreage every year.

Making a Garden in Rhodesia.

HINTS FOR BEGINNERS AND NEWCOMERS.

By Mrs. E. M. V. Carnegie.

(We are very pleased to publish the following article which is the first instalment of a series dealing with the flower garden and later with the kitchen garden. The authoress has been domiciled in Rhodesia (Southern and Northern) for the past seventeen years and has a wide and practical knowledge of her subject. The lucidity of expression and freedom from ambiguities will appeal to readers, and we feel sure that these articles will be a valuable aid to all who take a pride and pleasure in beautifying their surroundings with a nicely arranged and well stocked garden.—Editor.)

Clearing the Stand.—It is characteristic of British people that no matter where they are or how situated, they must have a garden. But not everyone knows how to set about making one, and it certainly does not look a very inviting proposition when one is confronted with the trodden-down rubbish heap that usually surrounds the house when the builders have finished with it. Take, for instance, the existing conditions on a mine camp or outside any Rhodesian town. A house is built and the stand defined, and you are left to do the best you can about it. First and foremost you spend several weeks, or maybe months, trying to find a garden boy. Why, it is difficult to say, but for some reason or other boys do not like garden work. They do not see

any sense in growing things to look at. "What is it for, Missus? You can't eat it," they say; and except for the patch where they surreptitiously put in a few mealie pips, they have no real interest in their work. They do it while you keep an eye on them, but all the time it is more or less under protest, and if you could translate their thoughts you'd probably find them saying, "It's just the white man; he's quite mad!" There *are* one or two exceptions, however, in the few thousand natives round about, and if you are lucky enough to strike one of them you will have found a treasure. Such a boy—I have had two in seventeen years—will work whether you are there or not, and will be really excited about the grass sprouting on the lawn or the first vegetables gathered from the garden.

Having found your garden boy, good, bad or indifferent (and you must take what you can get), and promised him an exorbitant wage, you set him to clearing the stand. There are bricks and sand, stones, bushes and tree trunks all about, and if you are going to make a garden that is worth while they all have to be cleared away, and in the case of bushes and stumps, uprooted. And the roots, especially in Northern Rhodesia, do travel such a long way! Also they have a very persistent way of sending up a new tree from every foot or two that is left in the ground, and many feet will be left if Adam, the gardener, is left to his own devices. So when a stump is removed every single wandering root must be traced to its furthest extremity and cleared right out. By the time your stand is clear you will have enough wood for a very respectable bonfire, the ashes of which should be saved and kept for further use, as they are a very desirable addition to the soil of your garden-to-be. The other rubbish —stones, tin cans, bottles and bricks—looks hopeless, but is not. If you want to grow carnations that won't damp off in the rains, you collect it all into a heap, adding odd bits of iron and cement, lumps of mortar and anything that does not seem to belong or fit anywhere else, and cover the whole lot completely with soil from around the dug-out stumps, mixing it freely with sand, lime and manure, and there you have the nucleus of a very fine carnation bed and rockery combined.

Quite an effective way is to make the top of the heap flat, with a few broad steps on one side leading up to it,

an open space in the middle which can be paved or gravelled or grassed, and a circular bed about three feet wide all round, leaving a space at the steps. This is an excellent place for carnations, for they must have plenty of drainage to do well, and here they will never damp off—the tin cans underneath will see to that. The largest stones that have been collected should be put all round the base to keep the soil from slipping, and others judiciously placed about the sides of the mound hold the earth in place right up to the top. In amongst them, verbenas, specially the little mauve one that ramps everywhere (*Verbena venosa*), swanriver daisies, creeping geraniums and petunias will all be very happy and will soon make the "rubbish heap" one of the prettiest spots in the garden. The steps to the top should be large, flat-topped stones, and the crevices between them could be planted with portulaca or any other small thing with very good effect. That disposes of a good deal of rubbish. What is left and all subsequent collections of weeds, mowings from the lawn, worn out plants, etc., should be heaped up in some inconspicuous corner at the back or put in a pit dug for the purpose and covered lightly with lime. When one pit is full or the heap big enough, make another, for this collection, when decayed, will prove invaluable when your garden beds need resuscitating.

Don't have a haphazard garden with no form or symmetry about it. While your boy is busy clearing the stand, sit down and plan your garden. Make up your mind where your borders and beds are to be, and whether you have room for a lawn and a few flowering shrubs; also just where you want to have porches or pillars, and whether you are going to have crazy paving, grass walks or gravelled paths. If you have a few native trees left, so much the better. *It takes a long time to grow a tree and very few minutes to cut it down.*

If you are lucky enough to have a little group of trees growing together, why not make that the site for your lawn? Grass under trees is surely prettier than grass in a bare expanse, and more useful. And seeing that a lawn that is worth having takes a long time to make—at least seven weeks—let us consider that first.

Laying Down a Lawn.—There is nothing more refreshing to the eye in this country of browns and yellows than

a patch of cool green, and given a fairly reliable water supply, there is no reason why we should not all have a lawn. It may be a fairly large stretch or just a green patch under the trees; but whatever the size of it, it is always a sight for sore eyes and a respite from the glare. We will suppose that there is a small plot available for grass when the garden has been laid out—say, 20 ft. x 50 ft. This will not require to be dug very deeply—not more than 18 inches—but should be very thoroughly turned over with pick and spade when it is dry, and all rubbish such as stones, sticks and weeds removed.

If you are making a garden in the rainy season, it is better to leave the lawn plot until there is a dry spell and turn your attention meanwhile to trenching for rose beds or flower borders. Then when the rain ceases awhile, go back to your grass patch. When thoroughly dug, rake in 50 lbs. of air-slaked lime, sprinkled as evenly as possible over the entire surface. This is sufficient for 1,000 square feet and larger or smaller plots must be treated proportionately. Burnt-out carbide is a useful substitute, and both it and lime discourage our enemy the white ant, and at the same time sweeten the earth.

Leave it to rest a week, and if it rains in the meantime, so much the better; if not, water thoroughly once, about the third day after raking in the lime. At the end of the week cover it with some kind of fertiliser. Well-rotted cow manure is the most easily procured and is as good as anything. It should be well pounded or passed through a coarse sieve, as if it is not sufficiently pulverised it will lie in lumps and produce an uneven colour in the grass. Bone dust or artificial fertiliser will do as well, and is better to have than manure that is at all fresh, as the latter, unless thoroughly rotted, more often than not contains a great many seeds which will undoubtedly grow and quite spoil the appearance of any lawn. Whatever fertiliser is chosen must be well spaded in and the plot then left severely alone for a month, only taking care to remove all weeds as soon as they appear. At the end of the month, if you are planting roots, you can proceed to make drills about 6 inches apart, and plant firmly when the ground is not too wet. Then roll the ground, or if a roller is not available, pat down firmly with a spade and water well.

Bradley, kikuyu and couch grass are all good for planting. The roots should be kept moist and must be thoroughly watered night and morning if the lawn is being made in the winter or during a dry spell of summer. If, on the other hand, you are growing your lawn from seed (which is the most satisfactory way, though it takes a little longer), at the end of the month roll and water the ground well and leave it again for a week or ten days before sowing. That makes nearly seven weeks of preparation, but it is well worth while if you want a lawn that will stand heat and drought as well as much rain (this applies more especially to Northern Rhodesia) and be springy and firm to walk on. It is the foundation that counts, as in everything else, and it pays to do the thing thoroughly. Also there is so much else in the garden waiting to be done that you will lose no time while waiting for the plot to be ready to plant.

There are several kinds of grass seeds from which to choose. Kentucky Blue is one that does well in this country if it has a little extra lime. Golden City mixture is another. Both of these are compounded of several different kinds of seeds, each chosen for some special quality, i.e., one that creeps and fills up gaps, one for its colour, another for its drought-resisting qualities. And they are chosen by experts. Messrs. Gowie, of Grahamstown, supply the former and Messrs. F. Kirchhoff and Co., corner of Jeppe and Loveday Streets, Johannesburg, the latter.

For a plot the size we have taken as an example (20 ft. by 50 ft.), 8 lbs. of seed would be enough, the cost of which would be about £1 for the Golden City mixture and rather more for Kentucky Blue. Choose a still day for sowing the seed, and divide your plot and your seed into equal parts so that it is evenly distributed. Rake it well in and either roll it or pat down firmly, covering it with light soil before watering. It must be kept moist, watered night and morning if planted in the dry season, and covered with grass or leaves till the plants are established. The seed germinates quickly, and there is usually a fine green mist showing about the fifth day. It should then have a dressing of sulphate of iron dissolved in water (½ lb. to 1,000 square feet), which makes it knit strongly together and gives it colour. From then, given good conditions, it goes gaily on and needs very little attention beyond watering and clipping for the first month

or two and then mowing once a fortnight. The shorter it is kept the thicker it grows, and if the ground has been well prepared you will have little or no trouble with weeds and a lawn that is a perpetual pleasure. Should white ants appear, a watering with arsenate of lead will destroy them.

Roses.—Was there ever a garden without roses, I wonder? There are gardens with few and gardens with many, but surely never one worthy the name without a rose at all. And they are so easy to grow and repay one so well for any trouble taken in preparing for them that everyone should have them, and lots of them. Naturally they are not going to produce their beautiful gifts of colour, scent and form if they are just dumped down anywhere and anyhow. They are the aristocrats of the garden and must be treated in a manner worthy of their station.

If you intend growing roses you will probably get a catalogue and read therein that "Roses do well in ordinary garden loam," and then you will turn to the stamped and trodden, hard-as-nails-looking bit of plot where you would like to have a bed of roses, and wonder if there is anything in all the world more unlike "ordinary garden loam." Perhaps also you will remember that there is such a thing as a white ant, a creature with an apparently insatiable appetite for the bark of rose trees, and you will almost decide to grow all your roses in tins. But don't. Believe me, there is no need, and a rose in a tin is not nearly so beautiful as a rose in mother earth's embrace, nor nearly so happy. With careful preparation and constant cultivation you can outwit the termite and grow your roses in the garden.

Let us turn that terrible-looking ground into a rose bed. First of all it must be dug with pick and shovel down to the sub-soil, or if that is very deep, to at least two feet. Then put a layer of well-rotted manure to keep the soil open and moist before mixing the dug-out soil with manure, lime, wood ash and decayed vegetable substance, and returning it to the trench. If you are using the limed garden litter from your heap or pit you will not need to add more lime. If the ground is very heavy and inclined to cake or harden, some sand should be added to make it friable and porous. If, on the other hand, it is already sandy, the addition of some good loam would very much improve it. Soil from a vlei

(Southern Rhodesia) or dambo (Northern Rhodesia) is excellent for this purpose. When this has been done and the soil returned to the trench, you will have some very respectable "garden loam" and be ready for your roses.

Now comes the choice of trees. If you want roses that flower practically all the year round, you will get Hybrid Perpetuals, Tea Roses and Hybrid Teas. The Hybrid Perpetuals give the richest dark colours and are very hardy, but do not produce so many flowers as the Tea Roses. There are so many of these, and new ones constantly being produced, that the choice is bewildering. We all have our favourites, and probably no two persons would choose alike if they had to select a dozen trees. The easiest way is to obtain a catalogue and spend a fascinating hour or two picking out those you feel you must have.

As a guide, Frau Karl Druschki, Edel, White Killarney and Mildred Grant are among the best white roses. Francois Dubrieul, George Dickson, Warrior and Mrs. Edward Powell good red ones. Lady Hillingdon, Lilian Moore, Harry Kirke and Gorgeous are fine yellow ones, and four lovely pink varieties are Betty Uprichard, Killarney, Madame Abel Chatenay and Mrs. Stewart Clark. Climbing roses seem to do better where the water supply is fairly heavy, and perhaps the most satisfactory in this country are the Wichurianas and Climbing Polyanthas, though of the ordinary climbers the following do well:—Ards Rover, which is a quick grower and very hardy; it is a deep crimson, with a fairly large, loose-petalled flower and very vigorous foliage—a splendid rose for climbing over a verandah. General McArthur is another good red climber, bright crimson and very sweet scented. You must be very careful to order *climbing* General McArthur, as there is also a bush tree of the same name, of which the climber is a sport. (Climbing) Lady Hillingdon is a lovely deep yellow rose, which also has a connection among the bush roses. Mermaid is a single yellow rose with beautiful foliage and is a strong grower. Among the Wichurianas the best for this country are:—Alberic Barbier (yellow), Emily Gray (yellow), Lady Gay (bright pink), Royal Scarlet (scarlet) and Hiawatha, a lovely pink rose with white centre. Some good polyantha roses are Blush Rambler (pink), Cornelia (strawberry) and Moonlight (white and yellow). Climbing roses need very little pruning and

flower almost all the year round. Wichurianas are splendid for covering banks or any irregular patches of ground, as they are evergreen and very strong and rapid in growth. Single roses do well and quickly form large bushes. The flowers are not, however, very good for cutting, which is perhaps the reason why they are not more popular. If they are grown at all they should be in a bed by themselves and not mixed with their more highly cultivated relatives.

A bed of single roses is a lovely sight in the early morning, when the buds are just unfolding. Irish Fire-flame has buds like lighted candles, which open to a deep orange splashed with crimson. Irish Beauty is a pure white rose with golden anthers—a lovely thing. Irish Afterglow is well named, for in bud it is deep orange and the open flower strawberry pink. Isobel is a clear bright pink flushed with scarlet. Mrs. Oakley Fisher, a rich orange yellow, with large flowers. Red Letter Day is not quite single and is a wonderful sight with its crimson flowers, which fairly cover the tree. Dainty Bess is one of the newer roses; it is a salmon pink with stamens of crimson and gold and very free-flowering. There are, of course, very many more; these are just a few that have proved themselves here and there in the country. Whatever the kind chosen, they must be very carefully planted. Quite a large hole must be dug to receive them, and any bruised or broken roots cut away. The healthy ones must be spread out as widely as possible and care must be taken to see that no fresh manure is anywhere near them. The soil should be shaken between the roots and more and more added until the part where the rose was grafted is covered at least one inch. This being done, the plant will send down roots from above the graft as well as below it, and so become doubly rooted and much stronger. The soil should then be *trodden* down all round the roots of the plant (it is not enough to press it down with the hand, as this does not make it sufficiently snug) and the ground literally soaked with water.

Some people water roses too much and produce mildew; others give them a sprinkle now and then and half starve them. Both are wrong. When a rose tree wants water it wants plenty and should be soaked, but this needs only to be done about once a week in dry weather and not at all in the rainy season.

It is a good plan to give roses manure water when they begin to bloom, and to continue to do so (once a week) all the while they are flowering; also, in the autumn about March or April, to put half-rotted manure round the plants. This serves a double purpose, encouraging autumn bloom and keeping the soil moist.

To discourage the white ant all rose beds should be continually hoed or dug over with a small garden fork, taking particular care to turn over the soil just near the plants, specially in dry weather. By this means also you double the value of watering and rain, and many gardeners will tell you that a thorough hoeing is as good or better than a watering.

Should your roses become infested with insects—and there are in this country one or two pests that are particularly fond of them—they should be sprayed with a special wash in the evening and with clear water next morning. A recipe is given for this purpose in the section called "Etceteras" (to appear later).

When the trees are firmly established, look out for suckers from below the graft and remove them as soon as they appear or the rose will be entirely ruined. You may get a vigorous-looking lot of leaves, but you will get no flowers. If there is the slightest doubt as to whether the shoot belongs to the stock or the scion, it is much safer to cut it right off. Also take away every weak shoot that comes in the way of a better one and rub off all buds growing towards the centre of the tree, then you will have a strong and graceful bush and roses that will delight your heart practically all the year round.

Remember to choose an open aspect for your roses, for in spite of the heat they prefer it to shade and are not nearly so likely to become mildewed.

The best time for transplanting roses is just before the rising of the sap, before the new buds begin to swell and when the old leaves are falling or turning yellow. It is possible, however, in this country to transplant at almost any time, provided the roots are not exposed to the air for any length of time in transit and also that the conditions the plant goes to are practically the same as those it has left.

(To be continued.)

Notes from the Irrigation Branch.

Cheaper Power for Tractors.—As readers are aware, the possibility of utilising a cheaper fuel than paraffin or crude oil is of great economic importance to this Colony. The use of green wood fuel for the production of suction gas would be the ideal solution of the problem, but there are many difficulties in the way of its general adoption, viz., loss of power when utilised in a tractor designed to consume oil fuel, and the problem of efficiently purifying the gas in a compact and comparatively light outfit. The first defect can only be obviated by purchasing a higher powered tractor than would be required if paraffin were to be used as fuel, as at present there is no tractor in the market designed to run solely on suction gas. A tangible proof that the second defect, however, is capable of solution was afforded by the arrival in Salisbury last month of a 4-ton Karrier lorry fitted with a Reading Compound Gas Producer attachment. This lorry had travelled up from Durban and utilised wood obtained on the way for the development of power, the fuel consumption being on the average about 3 lbs. of wood per mile. Many demonstration trips were given in the neighbourhood of Salisbury which proved the reliability of the outfit when operated on wood obtained locally. It was found desirable to strip the bark from indigenous timber before use, as apparently the bark of Rhodesian timber contains a high percentage of silica, which tends to clog the grates in the producer.

In the Compound Gas Producer no water is required for the production of the gas, which is solely derived from the combustion of wood, nor is any water required for scrubber attachments, as the products of combustion are drawn downwards through two grates and twice exposed to the intense heat of the fire, and all volatile matter thus extracted and a clean dry gas obtained which only contains a small proportion of dust. The gas, after leaving the combustion chamber, passes through scrubbers which encircle the producer, and is then delivered direct to the engine.

The scrubbing material consists of steel filings, asbestos cord, pebbles, etc., which require cleaning about once in 500 miles. The compact nature of the outfit will be realised when it is stated that a 30-60 b.h.p. producer complete only weighs 4 cwt.

A Rushton tractor fitted with this type of producer has been ordered by the Union Government, and the results of the trials will be awaited with interest. The Rhodesian Government has been alive to the possibilities of producer gas as fuel and had certain trials carried out in England last year with Rhodesian wood on a Peterboro' tractor fitted with the Compound Gas Producer. These trials were favourably reported on by Mr. Struben, the consulting engineer appointed for the purpose of conducting these tests, and the Government advised that a tractor fitted with the producer attachment should be tried out under ordinary Rhodesian farm conditions for a lengthy period. It is hoped that it may be found possible at an early date to give effect to this recommendation, as a severe reliability trial of this nature would be of the greatest value.

Irrigation Development.—During the recent circuit of the Water Court in Mashonaland, applications for irrigation schemes totalling in all about 1,400 acres were dealt with. It was gratifying to note that most of the schemes were either actually completed or definitely under process of construction.

On Messrs. Ward and Phillips' properties, New Year's Gift and Buffel's Drift, in the Melsetter district, a scheme for the irrigation of 500 acres is under construction and a portion of the area is already under irrigation. This must surely be one of the cheapest irrigation schemes in the world, as the total cost is unlikely to exceed £100. In the early stages of development it is intended to grow ordinary winter crops, such as wheat, barley and oats, but later it is probable that the whole area will be put under tea when full development is reached. At the time of the Court's visit in early July wheat was already being reaped from a portion of the area under irrigation. The unique experiment of growing tea under irrigation in this area is apparently proving very successful, as the report on samples of the locally grown product submitted to the British Tea Growers' Association is to the effect that it is better than high-grade Assam tea.

The pioneers of this experiment, however, have had the advantage of a life-long experience of tea growing, and it is not suggested that the success of the experiment will induce another "boom" in this Colony. It is of interest to note that on this estate portions of the irrigable area are consistently planted with maize in order that early mealies may be obtained, and in addition that irrigation water may be applied during the partial drought periods experienced in summer.

In the Mutema Reserve, situated in the Sabi Valley, an irrigation scheme which will command 250 acres of land is in process of construction, the cost of the scheme amounting to about £300, being financed from Native Trust Funds. It is not anticipated that this scheme will in any way induce native competition with European irrigators, as the area is remote from markets and the intention is merely to grow mainly native grain crops under irrigation and thus ensure consistent yields in this area of very erratic rainfall. It is hoped in this way to obviate the necessity for famine relief measures which have been commonly required in the past.

Near Macheke considerable developments have taken place on the property of the Anglo-Rhodesian Tobacco Company, and certain of the schemes originally constructed by that pioneer of irrigation, Mr. Jelliman, again put into operation. It is intended to irrigate about 120 acres on this estate, to be utilised for the growth of fodder crops and also for the planting out of early tobacco.

An example of keenness in marketing was displayed by one irrigator near Odzi, who was disposing of 1½ tons of vegetables per week under contract to a mine near Sinoia, and who confessed to be doing reasonably well out of the contract.

Soil Erosion.—The Irrigation Engineer (Matabeleland) reports that on a farm at Essexvale 1,600 feet of contour ridging has been pegged out, and it is hoped that this will be the forerunner of many farms in Matabeleland on which similar soil erosion protection works will be constructed. The farmer in question decided on adopting this measure after noticing the erosion which had occurred after one season's ploughing and having in mind the excellent results achieved by similar work he had carried out in the Banket area.

C. L. R.

Notice.

DEPARTMENT OF AGRICULTURE.

IMPORTATION OF PEDIGREE LIVE STOCK FROM ENGLAND.

Arrangements have been made whereby farmers in this Colony can import pedigree live stock—bulls, cows and/or heifers, rams, ewes, boars and sows—from Great Britain under the scheme existing between the Government of Southern Rhodesia and the Empire Marketing Board, which provides for the payment of the ocean freight and railage from Capetown to destination stations in Southern Rhodesia.

The Government, through the Live Stock Loan Fund, is prepared to grant financial assistance to approved applicants to purchase live stock up to the maximum amount under each heading indicated below, provided that the applicant in the first place deposits 25 per cent. of such amount.

For purchase of pedigree bulls	£200
For purchase of pedigree cows and heifers	250
For purchase of pedigree sheep	150
For purchase of pedigree pigs	150

Stock owners not requiring financial assistance may, subject to the approval of the Minister of Agriculture and Lands, have any selected pedigree animal exported under the assisted passage scheme.

Inoculation of cattle against redwater and gall-sickness will be effected at the buyer's risk and request, subject to the approval of the Director of Veterinary Research and provided the animal to be inoculated conforms to the require-

ments laid down on page 227 of the *Rhodesia Agricultural Journal* for April, 1925, and Bulletin No. 536.

As all animals exported from Great Britain under this scheme must be shipped prior to the 31st March, 1931, early application to participate in the scheme is essential, and no application received after the 30th September, 1930, can be considered.

Further particulars in connection with the cost of incidental expenditure, insurance, terms of payment, etc., together with forms of application to participate in this scheme, may be had on application to the Secretary, Department of Agriculture.

C. K. BRAIN,
Acting Secretary.

Department of Agriculture,
Salisbury,
19th July, 1930.

Seeds for Sale, Gwebi Farm.

Edible Canna ... ... 9/- per 100 tubers.

Sweet Potato Tubers ... ... 11/- per bag.

All prices quoted are for *delivery free at any station or siding* in Southern Rhodesia. Before sending cheques, intending purchasers are advised to ascertain that the seeds, etc., required are still available. Cheques should be made payable to "Gwebi Farm." All orders and enquiries should be addressed to the Chief Agriculturist, Department of Agriculture, Salisbury, *not direct to the Gwebi Farm.*

Correspondence.

[*No responsibility is accepted by this Journal for the views expressed by correspondents.*]

The Editor,
The Rhodesia Agricultural Journal.

Sir,

The Diplodia Menace.

With reference to the serious menace of *Diplodia* to which reference has been made in several articles in the Journal lately, I should like to ask if there is any restriction on the sale of infected seed by unscrupulous growers or dealers, as it would appear that with the disease on the increase, as it undoubtedly is, a more certain way of disseminating it could not be devised than the distribution of apparently sound but actually infected seed—*vide* your article, "The Few Brown Kernels in Your Maize Seed," of July, 1929.

I would at the same time sound a warning to fellow maize growers to be careful in the seed they buy, and to insist on a guarantee that not only the seed has been inspected by a competent Government official, but the lands, where the crop has been growing, at intervals during the course of its growth, to ensure absolute freedom from any chance of introducing the disease on to clean lands, which has been my unfortunate experience this year.

I consider legislation on the above lines to be absolutely essential, and that no seed whatsoever should be allowed to be offered for sale without the above guarantee.

I cannot, for obvious reasons, mention where my seed came from (I wish I could), but I can at least mention that over 100 acres of previously absolutely clean land, 30 acres of which was quite new land, is now all heavily infected, and for the sake of the price of 10 bags of seed I shall probably be the loser by some hundreds of pounds before the disease is eradicated—if it ever is.

I am, etc.,

Bembesi, J. R. PERRINS.
19th July, 1930.

The Plant Pathologist appends the following note:—

The question of legislation to control the sale of maize seed is one which bristles with difficulties, chiefly owing to the absence of any local standards by which seed may be judged. The matter referred to by Mr. Perrins, namely *Diplodia* infection, is not quite as serious as he imagines, inasmuch as the disease is not transmitted from infected seed to the cobs of the standing crop. As has been pointed out on a number of occasions, infection of the growing cob is brought about by spores which are harboured in old maize trash and carried by the wind to the main crop. Thus it is common to find a large percentage of mouldy cobs reaped from new land. The destruction of all old maize stalks, husks and cobs before the advent of the rainy season is the surest method of eradicating *Diplodia* under present conditions, and legislation along these lines would appear to be more desirable than that suggested by your correspondent.

That a great deal can be done by methods of selection to ensure a sample of seed which will give a good stand is unquestionable, but even our best maize growers are not able to exclude *Diplodia* from the seed for which they have gained high reputations. There is ample justification for saying that it is not possible to obtain *Diplodia*-free seed anywhere in the Colony. It is because this state of affairs exists that seed treatment is recommended with confidence by the Department. It must not be inferred from these remarks that Rhodesian seed is of poor quality, because most large maize growing countries throughout the world are suffering from the same disabilities.

A great deal of work needs yet to be done before the losses from *Diplodia* can be reduced to negligible proportions, but in the meantime the farming community can help themselves by practising seed selection and thorough field sanitation.

Chibi—	
Mtendelende	0.22
Gwanda—	
Gwanda Gaol	0.02
Tuli	0.01
Insiza—	
Albany	0.28
Filabusi	0.05
Fort Rixon	0.45
Inyezi	0.06
Lancaster	0.11
Scaleby	0.08
Wanezi Mission	0.16
Matobo—	
Bon Accord	0.12
Holly's Hope	0.10
Longsdale	0.20
Matopo Mission	0.18
Mtshabezi Mission	0.07
Rhodes Matopo Park	0.06
Umzingwane—	
Essexvale	0.10
Hope Fountain	0.25

ZONE C.—

Charter—	
The Range	0.35
Chilimanzi—	
Central Estates	0.17
Gwelo—	
Lalapanzi	0.10
Wold Farm	0.08
Hartley—	
Carnock	0.06
Lomagundi—	
Mpandegutu	0.17
Pendennis	0.09
Robbsdale	0.03
Woodleigh	0.12

Mazoe—	
Pembi Ranch	0.03
Salisbury—	
Agricultural Experiment Station	0.16
Ballineety	0.05
Cleveland Dam	0.08
Forest Nursery	0.07
Salisbury Agricultural Dept.	0.04
Sebastopol	0.11
Tobacco Experiment Station	0.01
Western Commonage	0.03
ZONE D.—	
Darwin—	
Rusambo	0.01
Inyanga—	
Inyanga	0.10
Juliasdale	0.98
Makoni—	
Eagle's Nest	0.10
Mazoe—	
Atherstone	0.21
Bellevue	0.14
Bindura	0.19
Citrus Estate	0.03
Craigengower	0.40
Donje	0.12
Frogmore	0.07
Glen Divis	0.07
Kilmer	0.16
Mazoe Dam	0.02
Ruia	0.15
Teign	0.17
Virginia	0.02
Visa	0.24
Zombi Farm	0.47
Mrewa—	
Montclair	0.03
Mrewa	0.16
Nyaderi Mission	0.10

Salisbury—

Arcturus	0.17
Glenara	0.15
Kilmuir	0.01
Meadows	0.04
Pendennis	0.18
Vainona	0.12

ZONE E.—

Belingwe—

Shabani	0.53

Bikita—

Angus Ranch	0.26
Bikita	2.02

Chibi—

Chibi	0.30
Lundi	0.22

Chilimanzi—

Allanberry	0.32
Felixburg	0.32
Induna Farm	0.20
Mukowries	0.40
Thornhill	0.53

Gutu—

Devuli Store	0.18
Eastdale Estates	0.28
Glenary	0.38

Gwelo—

Glencraig	0.28
Partridge Farm	0.23
Sheep Run Farm	0.12

Inyanga—

St. Trias' Hill	0.36

Insiza—

Stoneham (Brae Valley)	0.61

Makoni—

Craigendoran	0.31
Kairidzi	0.35
Monte Cassino	0.18
Ruati	0.18
Springs	0.17

Marandellas—

Bonongwe	0.03
Delta	0.23
Lushington	0.11
Macheke	0.10
Marandellas N.C.	0.04
Nelson	0.19

Melsetter—

New Year's Gift	0.46

Ndanga—

Doornfontein	0.96
Triangle Ranch	0.09

Selukwe—

Aberfoyle Ranch	0.70
Hillingdon	0.47
Rio	0.33
Safago	0.30
Selukwe	1.19

Umtali—

Argyll	0.44
Embeza	0.97
Fern Valley	0.41
Mountain Home	2.19
Mutumbara Mission	0.17
Odzani Power Station	1.10
Park Farm	0.59
Premier Estate	0.16
Sheba	2.46
Stapleford	2.18
St. Augustine's Mission	0.74
Umtali Gaol	0.14

Victoria—

Brucehame	0.47
Cambria	0.31
Chevenden	1.06
Clipsham	0.47
Gokomere	0.28
Kimberley Ranch	0.05
Mashaba	0.34
Miltonia	0.18
Riverdene North	0.50
Salemore	0.92
Silver Oaks	0.48
Victoria	0.25

ZONE F.—

Melsetter—

Chikore	1.22
Lettie Swan	1.47
Melsetter	2.18
Vermont	1.41

Umtali—

Cloudlands	1.11

Export of Cattle from Southern Rhodesia, 1930.

Month	Union		England.	Congo		N. Rhodesia.		Portuguese East Africa.		Total
	Slaughter		Slaughter							
	Johannesburg	I.C.S. for overseas	On hoof	Slaughter	Breeding	Slaughter	Breeding	Slaughter	Breeding	
January ...	...	...	...	2,449	67	...	...	...	...	2,516
February ...	...	...	...	3,438	8	537	91	...	11	4.085
March ...	25	...	160	1,097	...	249	...	...	7	1,538
April ...	53	863	...	2,636	115	120	...	...	...	3,787
May ...	783	1.628	160	1,517	593	268	176	...	...	5,125
June ...	1,132	2,660	...	1,810	11	407	...	...	..	6,020
July ...										
August ...										
September ...										
October ...										
November ...										
December ...										
	...	...	...	...	...	...	...	...	...	...

Dates of Meetings of Farmers' Associations, Southern Rhodesia.

Name of Association.	Place of Meeting.	Secretary.	Aug.	Sept.
			1930	1930
Ayrshire—Sipolilo	Various farms	G. H. Cautherley	9	13
Banket Junction	Banket Hotel	A. M. Hutchinson	2	6
Beatrice District	Farmers' Hall, Beatrice	W. Krienke	28	25
Bindura	Bindura Farmers' Hall	W. E. Fricker	8	12
Bromley	Farmers' Hall, Bromley Siding	E. Taylor	6	3
Bubi	Queen's Mine	W. H. Perham	15	20
Bulawayo Landowners' and Farmers' Association	Library Buildings, Bulawayo	T. B. Hepburn	5	2
Chakari	Various farms	R. Codrington	21	18
Daisyfield	Daisyfield (Aug.), Somabula (Sept.)	L. E. Edwards	16	13
Darwendale—Trelawney	Various farms	Charles H. Tanner	27	24
Eastern Districts	Farmers' Hall, Chidza	W. E. Richards	9	13
Enkeldoorn	Enkeldoorn	C. N. Ludlowe	5	2
Enterprise	Farmers' Hall	E. P. Venables	5	2
Essexvale	Essexvale	Col. D. Judson	17	21
Felixburg—Gutu	Fairburn (Aug.)	E. C. Fleetwood	9	...
Figtree Branch, R.L. and F.A.	Figtree Hotel	The Secretary	5	2
Gadzema	Gadzema Hotel	H. G. M. Liddell	8	12
Gatooma	Speck's Hotel	Col. J. A. Smith	16	20
Gatooma (Golden Valley Branch)	Golden Valley Hotel	C. K. James	9	13
Gazaland (South Melsetter)	Farmers' Hall, Chipinga	J. Ward	16	20
Greystone	Quarrie Farm	P. J. van der Walt	...	13
Gwanda	Lowenthal's Building, Gwanda	N. J. B. Nilson	16	20
Hartley	Hartley Hotel	Mrs. F C. Watson	9	13
Headlands	Headlands	J. A. Eve	...	...
Hunter's Road	Hunter's Road	R. W. Twilley	30	27
Insiza South	Farm Lancaster	J. Campbell	...	11
Inyazura	Inyazura	W. P. Frudd	1	...
Lalapansi	Lalapansi	A. Watt	9	13
Lomagundi	Sinoia	James S. Brown	...	...
Lomagundi West	Various farms	A. A. Bisset	10	14
Macheke	Various farms	R. O. Jackson	...	...

Macheke Valley (Headlands) Farmers' and Tobacco Growers' Association	Various Farms	T. R. Colam	2	6
Makwiro	Makwiro	W. L. Parsons	15	19
Marandellas	Marandellas Farmers' Hall	E. Cruikshank	1	5
Marandellas, Southern	Various farms	B. V. Cherry	6	3
Mashonaland	Mashonaland Farmers' Hall, Salisbury	P. Wilson	8	12
Matobo South	Farmers' Hall, Malundi Farm	W. S. George	16	20
Matopo Branch, R.L. and F.A.	Farmers' Hall, Malundi	W. Mirtle	16	20
Mazoe (Concession)	Various farms	Douglas Southey	8	12
Mazoe (Glendale)	Farmers' Hall, Glendale	Mrs. A. G. McCall	13	10
Melsetter	Court House, Melsetter	Capt. E. H. Allott	9	13
Ngezi-Umniati	Harvieston, Enkeldoorn	Miss Harvie	30	27
North Melsetter	Various farms	P. F. de Bruyn	9	13
North Umniati	———	J. F. Eagar	Not	received
Norton and Lydiate District	Norton	A. Jones	1	5
Nyamandhlovu	Nyamandhlovu	R. D. McLean	...	...
Odzi District Farmers	Odzi Hotel	M. Goldberg	2	6
Poorte Valley	Various places	A. D. Wilson	16	20
Que Que	Offices of the Que Que Sanitary Board	A. A. Ackerman	16	20
Rusape Farmers' Association	Rusape	E. C. Harrington	2	6
Salisbury South	Various farms	P. Linton	27	24
Shamva	Shamva Court House	L. H. S. Paxton	15	19
Shamva North	Various farms	Mrs. E. J. Stevenson	16	20
Two Rivers Farming Association	Various farms	W. L. Parsons	16	20
Umboe (Branch of Lomagundi F.A.)	Various farms	G. T. Gover	9	13
Umvukwe Farmers' and Tobacco Growers' Association	Various ranches	Com. Wrightson	9	13
Umtali	Drill Hall, Umtali	A. Howat	7	4
Umvuma and District	Court House, Umvuma	S. T. Montgomery	15	19
Victoria	Victoria	J. A. Halliday	2	6
Wankie District	———	F. H. Going	Not	received
West Umvukwe Farmers' Association	Various farms	G. H. Gordon	2	6
Western	Plumtree Hotel	The Secretary	9	13
Willoughbys	Willoughbys	A. E. Roberts	Not	received

Farming Calendar.

August.

BEE-KEEPING.

This month is one of inaction as far as the apiarist is concerned and the hive inmates are best left alone, except that once a week a corner of the quilt on the top crate may be lifted to see if the wax moth has gained a footing, as may easily be the case in a colony weakened by death from sundry causes, and in which case all such frames should at once be removed. Towards the end of the month, with warmer weather, the bees will be tempted out for play spells, cleansing flights, etc., and, according to the season, entrance stops may be opened out slightly with advantage.

In the workshop see that a spare hive or two are in readiness, well painted and ready for use at any hour; also have in readiness any requisite spares, and see that all appliances, such as veil, smoker, fuel, etc., are handy, for swarms may now go and come at a few minutes' notice. Where the bees have been left to their winter quarters with a fair supply of food, good results can confidently be looked forward to for the coming honey flow of the early winter weeks.

CITRUS FRUITS.

The first or spring growth should commence about the middle of the month, and the trees should have a good soaking of water when the new growth commences. If Washington Navel oranges are to set their main crop, frequent irrigations must take place from the time of blossoming up to the rainy season. These irrigations create the necessary humid conditions which are so essential to secure a satisfactory setting of this orange. It is advisable to stimulate the growth of unthrifty trees with an application of one to one and a half pounds of nitrate of soda when the first irrigation is given, this application of fertiliser to be followed by good cultivation. The amount of fertiliser recommended is for mature trees. The packing of late varieties will continue throughout the month. No bearing trees should suffer for want of moisture. Irrigation should not take place immediately before the harvesting of export fruit—at least ten days should elapse between irrigation and the harvesting. This is the best month to cut down citrus trees for re-working to better varieties. As the citrus trees are harvested, all dead, diseased and broken branches and shoots should be carefully cut out before the trees come into new growth.

CROPS.

If not already marketed, the main potato crop will probably be sold about now. Do not forget to grade the potatoes properly according to size. The buyer wants potatoes—table or seed—of even size, not large and small indiscriminately mixed. Select and clean farm-grown seeds ready for next season's planting. Label the bags with name and weight of contents. Build a proper shed for your seed potatoes on the lines recommended in the *Rhodesia Agricultural Journal*. Sort over seed potatoes in store and remove any diseased or rotten. Green oat or barley fodder on wet vleis,

or under irrigation, will become ready for cutting. Press on with ploughing and cross-ploughing. Decide what crops are to be grown next season, and, if you think fit, discuss the matter with officers of the Department of Agriculture. If you have not already effected all your purchases, consider the question of what seed you will require to buy for next season, and discuss the matter with other farmers. If in doubt, consult the Department of Agriculture. In frost-free situations, potatoes can be planted for an early crop under irrigation or on damp land. Cart and spread your farmyard manure and plough it under as soon as spread to avoid loss. If you have any long stable manure, apply it to your heaviest land. The application of phosphatic fertilisers to the land can continue. If you do not already have one, put up an implement shed, even if it be only poles and grass. Keep wagons and Scotch carts under a similar shed or in the shade of trees. Speed up the making and burning of bricks if this is still in progress.

DAIRYING.

At this time of the year the farmer should experience very little difficulty in producing cream of first-grade quality. As a rule the weather is sufficiently cold to prevent cream, produced under average conditions, from undergoing rapid deterioration, and it is not usually necessary, therefore, to separate a cream of such high butter fat content as is required during the warmer months of the year. During the winter months the separator should be adjusted so as to deliver cream testing 40 to 45 per cent. butter fat.

On exceptionally cold days care should be taken that the milk is not allowed to become too cold before separation—for efficient skimming, the milk should be separated immediately after milking and at a temperature not lower than 90 degrees F.

Farmers engaged in butter-making are usually successful in obtaining a good grain and firm body in butter at this season of the year. Cream can quite easily be cooled to churning temperature if placed outside the dairy and exposed to the atmosphere overnight. During cold weather, however, it is more frequently necessary to warm the cream for churning. The most satisfactory method of warming the cream to the proper churning temperature is to place the bucket or receptacle containing the cream in a tub or bath of water at a temperature of about 95 degrees F., stir the cream frequently and replace the water when cold.

This is usually a critical time of the year for young dairy stock. For dairy heifers, weaned calves, etc., there is possibly no better ration than one consisting of maize silage, legume hay and mixed concentrates, and these feeds, if supplied in liberal quantities, should serve to keep the young stock in a thrifty, growing condition.

DECIDUOUS FRUITS.

All plantings of deciduous trees should be completed by now, as the late planting of these trees is generally unsatisfactory. Pruning may be continued up to the middle of the month. It is advisable to water or irrigate all deciduous trees before blossoming; if possible, a second irrigation should be given after the trees have set their fruit. Follow up the irrigations with good cultivation.

ENTOMOLOGICAL.

Potato.—Early planted crops of potatoes may be attacked by caterpillars. The crops should be sprayed immediately with an arsenical wash.

Cabbage Family.—Young plants of this family should be kept sprayed with an arsenical wash to check attack by webworm. Do not spray plants of which the foliage is to be eaten within three weeks of use.

Onion.—May still be troubled with thrip. Use tobacco wash or paraffin emulsion.

Citrus Trees.—May be sprayed or fumigated against scale insects, having regard, however, to presence of fruit and blossom. Spraying and fumigating for scale should not be carried out whilst trees are in blossom. Clear young growth of aphis previous to blossoming, using nicotine, tobacco wash or Derris.

Guava.—Collect and destroy remnants of late crops to keep down citrus codling, especially if trees are in vicinity of citrus orchards.

FLOWER GARDEN.

Complete digging or forking over the soil as early as possible. Divide and replant dahlias, delphiniums, Shasta daisies, etc. Plant bulbs—tuberose, arum lilies and gladioli. Sow seeds of hardy annuals. Mulch newly-planted roses, shrubs, etc.

VEGETABLE GARDEN.

Plant out asparagus, cabbage, cauliflowers, onions and early potatoes. Sow seeds of tomato and other plants that are susceptible to frost in a sheltered position; also seeds of various vegetables and salads for summer use.

FORESTRY.

Cuttings of ornamental shrubs, roses, etc., struck in sand last month should be transplanted into good soil as soon as they show a good healthy growth of leaves. A large percentage of cuttings will damp off if left in sand longer than about six weeks. No manure should be added to the potting soil. Seed beds should be prepared and gum seeds sown if required for planting early in the season. If the trees are to be grown in seed beds only and not in tins, then gum seeds should not be sown until October, or later, as they will get too large.

GENERAL.

Fire guards should be completed and every precaution taken to guard against loss of grazing from fires. Natives commence ploughing their softer land this month, and for this reason, as well as because beer is plentiful at the kraals, local labour is apt to be scarce. At this time of the year, however, the need for boys on farms is not so severely felt as later on.

POULTRY.

By the end of this month all those who are not able to give much attention to the chicks while in the growing stage should have stopped hatching. Those who can give some extra care, can continue hatching for another month, but not later, for chicks hatched after August are usually slow in growth and weedy. They do not lay till some months after they should, and eggs are few in number; in fact, they are generally unprofitable.

Now that the hot weather is approaching, a constant war on insects must be carried out, and of these sand fleas and fowl ticks (erroneously called tampans) will be found to be the most troublesome. A bulletin on fowl ticks can be obtained upon application to the Poultry Experts, Department of Agriculture. Sand fleas, as most poultry keepers know, are found on the face, wattles, ear-lobes and combs of the birds. Application of carbolised vaseline will usually kill them at once, or two or three applications of any ordinary grease on successive days are efficacious. More than this is, however, necessary, for the breeding quarters of these insects (and they multiply very rapidly) are in the dust on the floor of the house and that of the run.

The best preventive is a hard floor (preferably of concrete) with no cracks. If this is not possible, the floor and around the house should be treated every week in one of the following ways:—(1) Thorough soaking with a solution of one teacupful of Kerol, Jeyes, Hycol, Izal, or similar disinfectant to a paraffin tin of water, or (2) with a strong solution of

salt and water, or (3) dusting over and raking into the soil a mixture of one part flowers of sulphur and two parts finely powdered lime.

Ducks.—See that the breeding ducks have plenty of water, and if possible also some to swim in. Keep young ducklings out of the hot sun, otherwise there will be many deaths. The same applies to geese and goslings.

Turkeys.—Young turkeys must be protected from cold at night, for this is fatal to them. Give them as much free range as possible, and do not allow them to run round the house or on the same ground as fowls do. Turkeys like clean ground; any that is tainted is very detrimental to them. Let them find most of their food in the bush.

STOCK.

Cattle.—On the early granite and sand veld probably the worst of winter is over so far as grazing is concerned, and a nice bite of green grass is appearing. Care should be taken where cattle are allowed to graze on the early burnt grass not to let them get too much at first. On red soil farms the haystack will still be required, and in all cases a certain amount of hay or ensilage should be held in reserve against the possibility of very late rains. The bulls may again be put back into the herds. Any very young calves should be kept near home, and dipping should be carefully attended to. In dairy herds on any soil whatever, feeding, housing and bedding cannot be relaxed. Cows in full milk will benefit by a ration of, say, 5 lbs. of maize (crushed and soaked), 30 lbs. to 40 lbs. of ensilage or pumpkin and 8 or 10 lbs. of hay. If it is possible to give, in addition to the above daily ration, 2 lbs. of peanuts, crushed with the shell, or linseed ground with maize, or oil cake, a very great benefit will be derived. Calves, especially young ones, must be carefully watched; they should not run too far, and are better inside, except when the weather is warm. It will pay to feed to them a little sweet hay, bean meal, linseed, peanuts or peanut cake and a small ration of green food.

Sheep.—Sheep should give little trouble at this time of the year, but on very dry veld a handful of mealies and a little hay or ensilage will materially assist ewes with young lambs.

TOBACCO.

The seed bed site should be cleared and well ploughed, preparatory to burning and sowing. The usual date of sowing the first beds is the 15th September. Bulletins covering every phase of tobacco culture can be had upon application to the Editor.

VETERINARY.

Redwater and gall-sickness occur all the year round, although these diseases are more prevalent during the summer months. A good many deaths occur this month, however, amongst imported stock. Vegetable poisoning will probably be in evidence. Sheep can be inoculated against blue tongue. Scab is a poverty winter disease.

WEATHER.

No rain is to be expected, and even on our eastern mountains the the nights are apt to be cold, and grazing being scarce, food and shelter precipitation is trifling. Showers, however, do occasionally fall in places, but are of no consequence. The sun is often warm during the day, but are necessary for the stock.

September.

BEE-KEEPING.

This is an important month for the bee-keeper, as it starts the first flow of the season. All hives that were sent into winter quarters on a double brood chamber, or otherwise with ample food for that period, should now be overflowing with young in all stages and with a population large enough to take full advantage of the flow. All hives should be carefully examined now and again, entrances opened out to suit the advancing warmth of the weather, and where necessary ventilator lids replaced on the top crates under the hive lid. See that no worry is caused to the bees by ants getting up, and that ample stores of good water (with a pinch of salt and a dash of vinegar) are available for drinking purposes, of which bees consume quite a lot. Swarms can now be looked for; if not required, they can best be destroyed by carbon bisulphide or calcium cyanide—both requiring very careful handling. If it is wanted to increase the apiary, as soon as the scouts are seen looking round for a home, get the decoy hive ready filled with dummy and proper frames of full foundation sheets, or, better still, if they are available, old drawn out brood combs, and as soon as it is taken possession of, insert if possible a frame or two of unsealed brood. As a rule the swarm will settle down at once. Such a colony is best placed in the apiary the same evening, if it can be so arranged. Do not make the mistake so often seen of supplying the new colony with starter frames only; give them full foundation sheets; it pays every time, and more especially so in the first early honey flow. Be sure also and protect the apiary against that persistent robber, the honey bear or ratel, by fencing it with fowl netting and pegging that down with wooden pegs every two feet. The two-footed robber can be just as effectively dealt with by placing a small light chain round the entire hive fastened with small staples and a padlock.

CITRUS FRUITS.

The fate of the citrus fruit crop is dependent upon the treatment the trees receive during this month. If the trees have been given the treatment recommended in the August calendar, and this treatment is followed by good irrigations and cultivation, a good crop of fruit can be expected, whereas a total failure may be the result if the trees suffer for want of moisture at this season of the year.

If not already done, all top worked trees should be headed back early in the month. This cutting back will induce the dormant buds (set in autumn) to commence growth. As the new shoots develop the old tops may be further shortened back until the old top is displaced with a new profitable one.

The packing of late varieties must be speeded up and completed by the end of the month if possible, as the late packed fruit is likely to deteriorate in quality or come into competition with Mediterranean fruits.

All adventitious shoots (water shoots and suckers) must be cut off as they appear, and this work should be continued throughout the growing season.

CROPS.

Utilise your labour to the fullest extent for stumping and clearing more land for mixed crops and for general farm development. Do not

be satisfied unless each year sees more profit-earning development work effected. Good organisation of the farm work will permit of much being done without great cost. Begin marking out holes for hand check-row planting of maize, and apply manure or fertiliser. Fertilisers which are to be broadcasted and ploughed or harrowed in can be applied. Do not forget that lands which have been green manured in March or April will require a second ploughing about this date or before being seeded to crops. Early varieties of winter cereals ripen this month and require harvesting. Danger from frost should be past now, and crops susceptible to frost, such as potatoes, onions in beds for the summer crop and Jerusalem artichokes, may be planted where lands are moist. Pumpkins and early maize may be planted on vlei lands. Edible canna may be planted "dry" during the latter half of this month, where some rains may be expected during next month. Overhaul all implements and replace worn parts. Putting this off till the planting season may mean serious loss of planting opportunities between rains. Get out the planters and seed drills. Overhaul and place in proper working order. Ploughing and cross-ploughing should be hurried on with; also the ploughing under of farmyard manure. A spiked roller can usefully be employed for breaking down clods, particularly on those lands which are to be planted first. Make every effort to secure as good a seed-bed as possible; good seed-beds mean good stands, and good stands are all-important in securing good yields.

DAIRYING.

This is generally the quietest month of the year from a dairying standpoint. Most farmers have by this time exhausted their supplies of winter feed and the production of dairy products is consequently at its minimum. Town milk supplies are now falling off, and a greater use of purchased concentrates in the form of ground nut cake and bran is advisable to keep up the milk supply. Very little cheese is made during this month and stocks are naturally low. Old cheese should be cleared out of the storeroom before the advent of hot weather, and if possible should be sent to be stored under cold storage conditions. Considerable difficulty is to be expected in making butter during this month, as the early spring grass is shooting in the vleis and the butter is consequently very soft. To counteract this, greater use should be made of cotton seed cake, of which a small supply is expected to be available this season.

DECIDUOUS FRUITS.

Newly planted trees must not be permitted to become too dry; watering by hand or gravitation must be continued until the rains commence. Ten gallons of water every fourteen days are sufficient for young trees; these applications should be followed by the loosening of the soil to prevent undue evaporation of the added moisture.

All undesirable growths on the stem and in the centre of the trees should be suppressed as they appear; this will enable the retained shoots to develop normally.

Early fruits must be thinned out this month; only retain two or three fruits on each bearing twig or shoot. Those that are left will then develop into large and attractive fruits.

ENTOMOLOGICAL.

Cotton.—Prevention for most of the boll-worms will be the proper preparation of the ground, with thorough cultivation and eradication of all weeds on the land, particularly those of the family Hibiscus. Wild host plants for stainers should be sought out and destroyed.

Tobacco.—Young plants in seed-beds may suffer from cutworms. Frequent cultivation and laying down of poisoned bait—50 lbs. bran and

21 lbs. Paris green; bring to consistency of a stiff dough, adding water when necessary. Distribute this over the seed-beds in the forenoon, as the cutworm does most of its feeding at night. The beds should be thoroughly burnt over with wood or dry tobacco stalks to ensure that the seed-beds are free from cutworms, and baiting for any coming in from the surrounding ground should then be resorted to when the plants appear. Clear the ground for some distance round the beds, say 30 yards in all directions, and bait this ground thoroughly before sowing—this clearance allows a wide margin over which the cutworms would have to travel. Cutworms' moths are nocturnal in habit, so that the coverings of the beds need to be moth-proof at night; this should be seen to each evening.

Potato.—Early potatoes are liable to suffer from caterpillars. The crop should be sprayed at first sign of injury with an arsenical wash.

Cabbage.—During this month the most prominent enemies of plants of this family are diamond-back moth and web-worm. Cabbage louse is sometimes troublesome. The young plants may be sprayed or dusted with an arsenical compound for the former, and sprayed with tobacco wash and soap for the latter.

Beans.—Planted under irrigation during September usually escape serious infestation with stem maggot.

Citrus.—Throughout the month lime-sulphur spray (1-100) may be used to control yellow citrus thrip whilst on very young fruit. A useful spray against black aphis and thrip is the following:—Nicotine, 9 ozs.; Capex spreader, 7 ozs.; water, 100 gallons; Capex lime-sulphur, 1 gallon. This may be sprayed or fumigated against scale insects, having regard, however, to presence of fruit and blossom. Spraying and fumigating for scale should not be carried out whilst trees are in blossom. Clear young growth of aphis previous to blossoming, using nicotine, tobacco wash or Derris.

FLOWER GARDEN.

Cultivate extensively to prevent evaporation and to keep weeds in check. Water plants newly set out, especially such as have their roots near the surface. Thin and regulate growing shoots on roses and various shrubs. Plant out cannas and chrysanthemums (for massing and border decorations) and other herbaceous plants.

VEGETABLE GARDEN.

Sow French beans, leek, spinach, cucumber, egg plant, celery, rhubarb, melons and tomatoes. Small sowings of peas, turnips, beet, lettuce, radish, carrot, parsnip may be made now.

FORESTRY.

All cuttings struck in sand in July and not yet transplanted into good soil should have this done as soon as possible. Tentative sowings of eucalypt seeds should now be made on a small scale, so that transplants will be ready in case the first half of the rainy season should prove favourable; otherwise, bulk sowings should be postponed to October-November.

GENERAL.

Indigenous labour is apt to become more scarce at this time of the year, the boys returning to their kraals to break up the land for next season. Stock are liable to stray in search of the young grass now coming up, and much trouble from this cause is to be looked for on unfenced farms. Natives are now cultivating their gardens preparatory to sowing their crops, which they do much earlier than do Europeans. The mischief caused by veld burning becomes apparent from this time onwards in the condition of the stock, and it is necessary frequently to move them away in search of grazing.

POULTRY.

The supply of green food to the birds must be kept up; in fact, during the hot weather they require more.

During our dry season the available supply of such green foods as lettuces, cabbages, sunflower leaves is much reduced, but there are many others that can be used, such as belhambra, plumbago, wild cockscomb, plantain leaves, paw-paw leaves, etc. Sprouted oats, barley and wheat should also be used. Many of the young cockerels should now be fit for killing. Keep the best and get rid of the remainder. It is very advisable to caponise all young cockerels when about 2½ lbs. weight. The "Rhodesia Agricultural Journal" of October, 1924, and Bulletin No. 517 give clear and concise details as to the method of performing the operation. Some of the earliest hatched young pullets will show signs of commencing to lay now. No light breed bird should lay until it is 5 to 5½ months old, or a heavy breed until it is 6 to 6½ months old. Should any show signs of commencing to lay before this, they should be moved from run to run to prevent their doing so. A bird that lays before it is fully matured will stop growing, will always be small, and its eggs will for its first year of laying also be small.

When the pullets are four months old, i.e., those of the light breeds, they should be put into their permanent laying quarters, and those of the heavy breeds when they are five months old. A bird that is moved after it has started to lay will stop and very probably go into a moult.

See that young ducklings get plenty of shade during the hot weather. Those destined for killing should not be allowed free range or even a medium-sized run, but should be kept fairly crowded in small runs. It is necessary to get the flesh on them as quickly as possible, and the more rest and less exercise they have, the more rapid will be the growth, and also more succulent and tender the flesh.

The hatching of turkeys should proceed rapidly and be carried on until the end of the dry season. See that they have plenty of chopped onions or onion tops or eschalots, and thick separated milk. These are absolutely necessary if the turkey breeder wishes to be successful with his rearing. Do not give wet food; dry mash such as given to chickens is the better.

STOCK.

Cattle.—Ranching cattle should require little now in a normal season; it is only in the event of very late rains that trouble should be expected. Where possible, it will be wise to keep an eye on those cows that may be expected to calve early, with a view to feeding them if necessary, and seeing that they do not get too poor. The dairyman will carry on much as in August; he will, however, use his discretion (in accordance with the condition of his veld) as to the use of ensilage, pumpkins or other bulky and succulent food. He will be wise not to shorten the supply of concentrated foods for some time to come. A little hay or ensilage should still be kept in reserve until the rains have fallen in reasonable abundance.

Sheep.—The remarks for August apply. If spring lambs are expected, it will be wise to see that the sheep shed is in good order—clean, dry, properly drained and airy. Watch that the ewes shall not be poor when they lamb, and remember that they cannot rear good lambs if the veld is bad, but must have their grazing supplemented, just as milk cows are fed in order to produce milk.

TOBACCO.

Hasten preparation of seed beds. Begin sowing seed beds each fortnight for the acreage proposed to be planted; fertilise and stimulate growth so as to be ready for planting out should rain come early in November.

VETERINARY.

There should be very few deaths from redwater and gallsickness this month. Cases of vegetable poisoning of stock picking up tempting young green shoots of dangerous character on the burnt veld are of frequent occurrence. Sheep can be inoculated against blue tongue, but ewes in lamb should not be treated, on account of the danger of abortion. Scab may be prevalent.

WEATHER.

The temperature may be expected to rise steadily during this month. Rains are not due until next month, though the average over a period of years shows slightly more than in the previous four months, and ranges between .1 and .5 inch. Frost has been known to occur in September, although this is a very unusual event. Rain-gauges should be seen to before the rains commence. They should be carefully adjusted to stand exactly level with the lip four feet above ground, and care should be taken that no tree, building or other obstruction interferes with the fair precipitation of rain into the orifice.

Notes from the "Gazette."

"*Gazette*" *Date.*	*Items.*
	TOBACCO EXPORT AND IMPORT REGULATIONS.
11.7.30.	Government Notice No. 453 contains the regulations governing the export of tobacco from this Colony to the Union of South Africa.
	AFRICAN COAST FEVER.
18.7.30.	Government Notice No. 461 releases the farm Girliesfontein B from the guard area in the native district of Charter.

Departmental Bulletins.

The following Bulletins, consisting of reprints of articles which have appeared in this Journal, are available for distribution free of charge to applicants in Southern Rhodesia only. Outside Southern Rhodesia, 3d. per copy.

AGRICULTURE AND CROPS.

No. 174. Notes on Hop Growing, by H. G. Mundy, F.L.S.
No. 225. Napier Fodder or Elephant Grass, by J. A. T. Walters, B.A.
No. 278. New Crops for Rhodesia, by J. A. T. Walters, B.A.
No. 362. The Cultivation of Rice, by H. G. Mundy, F.L.S.
No. 403. Florida Beggar Weed, by H. G. Mundy, F.L.S.
No. 429. Propagation of Kudzu Vine, by H. C. Arnold.
No. 442. Swamp or Irrigation Rice, by K. V. Yoshi, Bombay.
No. 510. Check-row Planting of Maize, by H. G. Mundy, F.L.S.
No. 513. The Carob Bean in Rhodesia, by J. A. T. Walters, B.A.
No. 541. The Potato Crop under Irrigation, by G. R. Syfret.
No. 545. Artificial or Synthetic Farmyard Manure, by H. G. Mundy, Dip.Agric., F.L.S.
No. 550. Onion Growing under Irrigation, by C. Mainwaring.
No. 561. Wheat Growing in Rhodesia, by C. Mainwaring.
No. 568. The Treatment of Arable Land, by G. N. Blackshaw, O.B.E, B.Sc., F.I.C.
No. 581. Leguminous Crops for Stock and Soil Improvement in Southern Rhodesia, by C. Mainwaring, Agriculturist.
No. 590. Rye, by H. W. Hilliard, Junior Agriculturist.
No. 591. Maize Export Conference Proceedings.
No. 598. Drought-resistant and Early-maturing Crops for Areas of Late Rainfall, by C. Mainwaring.
No. 599. Rhodesian Soils and their Treatment, by E. V. Flack.
No. 601. Maize for Export, by S. D. Timson.
No. 603. The Production of Maize in Southern Rhodesia, by C. Mainwaring, Agriculturist.
No. 627. The Growing of Potatoes in Southern Rhodesia (Revised), by C. Mainwaring, Agriculturist.
No. 630. The Storage of Seed Potatoes, by H. C. Arnold.
No. 634. Barley, by P. V. Samuels.
No. 643. Noxious Weeds in Southern Rhodesia, by F. Eyles, Botanist.
No. 650. Coffee Culture in Southern Rhodesia, by G. W. Marshall, Horticulturist.
No. 651. Two Important Leguminous Crops: The Velvet Bean and Dolichos Bean, by C. Mainwaring, Agriculturist.
No. 656. Tractor Notes, by A. W. V. Crawley, M.E., F.G.S.
No. 657. Hay-making in Southern Rhodesia, by C. Mainwaring, Agriculturist.
No. 663. The Use of Fertilisers and Manures in Southern Rhodesia, by A. D. Husband, A.I.C., Chief Chemist.
No. 672. Hay-making in Rhodesia, by H. G. Mundy, Dip.Agric., F.L.S.
No. 674. Top Dressing of Maize against Stalk Borer, by H. C. Arnold.
No. 681. The Sunflower (Helianthus Annuus) (Revised), by S. D. Timson, M.C., Dip.Agric.
No. 684. Warning to Maize Growers: Maize for Export.
No. 685. Notes on Farm Practice at the Government Farm, Gwebi, by S. D. Timson, M.C., Dip.Agric.

No. 694. The Edible Canna (Canna Edulis), by D. E. McLoughlin.

No. 695. The Castor Oil Plant (Ricinus spp.), by S. D. Timson, M.C., Dip.Agric.

No. 697. Results of Analysis of Samples taken under the "Fertilisers, Farm Foods, Seeds and Pest Remedies Ordinance" during the year 1927-28.

No. 700. Further Notes on Farm Practice at the Government Farm, Gwebi, by S. D. Timson, M.C., Dip.Agric.

No. 704. The Importance of Research on Pasture Improvement in Southern Rhodesia, by A. D. Husband, A.I.C., Chief Chemist.

No. 705. Suggested Cropping Programmes for Farms on the Sand Veld, by D. E. McLoughlin, Assistant Agriculturist.

No. 706. A Farmers' Calendar of Crop Sowings, by C. Mainwaring, Agriculturist.

No. 708. Witch Weed or Rooibloem (Striga Lutea)—a Serious Menace to Maize, by J. A. T. Walters, B.A., F.R.S.A., Agriculturist.

No. 709. Sand Veld Farming and its Possibilities, by E. D. Alvord, M.Sc. (Agr.).

No. 710. Monthly Reminders for the Farming Year, by the Division of the Chief Agriculturist.

No. 713. Ensilage, by J. A. T. Walters, B.A., Agriculturist.

No. 724. Ploughing by Tractor, by A. W. V. Crawley, M.E., F.G.S.

No. 727. Farmyard Manure, by A. P. Taylor, M.A., B.Sc., Agricultural Chemist.

No. 743. Sunn Hemp, by S. D. Timson, M.C., Dip.Agric.

No. 750. Cotton in Southern Rhodesia—Hints to Growers, by G. S. Cameron, Empire Cotton Growing Corporation.

No. 751. The Sweet Potato, by S. D. Timson, M.C., Dip.Agric. (Wye).

No. 757. Maize on the Sand Veld: Results at the Tobacco Experiment Station, Salisbury, by C. A. Kelsey-Harvey, Manager.

No. 758. Instructions for Taking Soil Samples. Issued by the Division of Chemistry.

No. 759. Witch Weed (Striga Lutea): Methods of Control, by S. D. Timson, M.C., Dip.Agric. (Wye).

No. 762. The Value of Rock Phosphate and "Bone and Superphosphate" as Fertilisers for Maize Production, by A. D. Husband, Chief Chemist.

No. 768. The Ground Nut (Arachis hypogaea), by S. D. Timson, M.C., Dip.Agric. (Wye).

No. 775. Agricultural Costings at the Gwebi Farm, by H. G. Mundy, Dip.Agric., F.L.S., Chief Agriculturist, and J. Hick, Accountant.

No. 776. Regulations Governing the Export of Maize and Maize Meal through the Port of Beira.

No. 777. Some Aspects of Cost of Production Studies in Agriculture, by Arthur G. Ruston, D.Sc., Department of Agriculture, Leeds University.

No. 781. Agricultural Costings at the Gwebi Farm—Maize and Green Manuring, by H. G. Mundy, Dip.Agric., F.L.S., Chief Agriculturist, and J. Hick, Accountant.

No. 783. Agricultural Costings at the Gwebi Farm—Fattening for Beef, by H. G. Mundy, Dip.Agric. (Wye), F.L.S., Chief Agriculturist.

No. 787. Agricultural Costings at the Gwebi Farm—Ground Nuts and Maize and Beans for Silage, by H. G. Mundy, Dip.Agric. (Wye), F.L.S., Chief Agriculturist.

Botanical Specimens for Identification.
Accelerating the Sprouting of Potatoes.

REPORTS ON CROP EXPERIMENTS.

No. 94. Second Report on Experiments, by J. H. Hampton.

No. 216. Manuring of Maize on Government Experiment Farm, Gwebi, by A. G. Holborow, F.I.C.

No. 220. Reports on Crop Experiments, Gwebi, 1914-15, by E. A. Nobbs, Ph.D., B.Sc.

No. 221. Results of Experiments, Longila, 1914-15, by J. Muirhead.

No. 239. Reports on Crop Experiments, Gwebi, 1915-16, by E. A. Nobbs, Ph.D., B.Sc.

No. 246. Reports on Crop Experiments, Gwebi, 1915-16, Part II., by E. A. Nobbs, Ph.D., B.Sc.

No. 268. Manuring Maize, Government Farm, Gwebi, by A. G. Holborow, F.I.C.

No. 279. Report on Crop Experiments, Gwebi, 1916-17, by E. A. Nobbs, Ph.D., B.Sc.

No. 341. Report on Crop Experiments, 1918-19, Gwebi Experiment Farm.

No. 342. Rotation Experiments, 1913-19, by H. G. Mundy, F.L.S., and J. A. T. Walters, B.A.

No. 382. Annual Report of Experiments, Experiment Station, Salisbury, 1919-20.

No. 405. Annual Report of Crop Experiments, 1920-21, Gwebi Experiment Farm, by H. G. Mundy, F.L.S., and J. H. Hampton.

No. 411. Annual Report of Experiments, 1920-21, Experiment Station, Salisbury, by H. G. Mundy, F.L.S.

No. 413. Arlington Sand Veld Experiment Station, First Report, by H. G. Mundy, F.L.S., and E. E. Wright.

No. 432. Bulawayo Municipal Experiment Station, First Report, by H. G. Mundy, F.L.S.

No. 433. Winter Cereal Experiments, 1921, by D. E. McLoughlin.

No. 437. Annual Report of Crop Experiments, Gwebi Experiment Farm, 1921-22, by H. G. Mundy, F.L.S.

No. 440. Annual Report of Experiments, 1921-22, Experiment Station, Salisbury, by H. G. Mundy, F.L.S.

No. 485. Annual Report of Experiments, 1922-23, Agricultural Experiment Station, Salisbury, by J. A. T. Walters, B.A.

No. 486. Bulawayo Experiment Station, Annual Report for Season 1922-23, by H. G. Mundy, F.L.S.

No. 514. Bulawayo Experiment Station Report, 1923-24, by H. G. Mundy, F.L.S.

No. 519. Annual Report of Experiments, 1923-24, Agricultural Experiment Station, Salisbury, by H. G. Mundy, Dip.Agric., F.L.S.

No. 537. Crop Rotations on the Gwebi Experiment Farm, 1923-24, by H. G. Mundy, Dip.Agric., F.L.S.

No. 564. A Maize Rotation Experiment, by A. R. Morkel.

No. 566. Bulawayo Experiment Station, Annual Report for Year 1924-25, by H. G. Mundy, Dip.Agric., F.L.S.

No. 608. Annual Report of Experiments, 1924-25, Agricultural Experiment Station, Salisbury, by H. G. Mundy, Dip.Agric., F.L.S.

No. 631. Bulawayo Experiment Station : Annual Report for Year 1925-26, by H. W. Hilliard.

No. 649. Annual Report of Experiments, 1925-26, Agricultural Experiment Station, Salisbury, by H. C. Arnold, Manager.

No. 675. Bulawayo Experiment Station—Annual Report for Year 1926-27, by D. E. McLoughlin.

No. 683. Annual Report of Experiments, 1926-27, Agricultural Experiment Station, Salisbury, by H. C. Arnold, Station Manager.

No. 688. Report, 1923-24—1926-27, Gwelo Municipal Demonstration Stations, by D. E. McLoughlin.

No. 716. Report, 1927-28, Gwelo Municipality Demonstration Stations, by S. D. Timson, M.C., Dip.Agric.

No. 745. Salisbury Agricultural Experiment Station Annual Report, 1927-28, by H. C. Arnold.

No. 767. Gwelo Municipal Demonstration Stations. Annual Report for the Season 1928-29, by D. E. McLoughlin.

No. 773. Bulawayo Municipal Demonstration Station: Report for the Seasons 1927-28 and 1928-29, by D. E. McLoughlin, Assistant Agriculturist.

No. 789. Agricultural Experiment Station, Salisbury: Annual Report of Experiments, 1928-29, by H. C. Arnold, Manager.

TOBACCO.

No. 605. Flue-curing Tobacco Barns, Bulking and Grading Sheds, by P. H. Haviland, B.Sc. (Eng.), Acting Government Irrigation Engineer.

No. 607. Tobacco Seed Beds, by D. D. Brown.

No. 615. The Culture of Virginia Tobacco in Southern Rhodesia—Field Management, by D. D. Brown.

No. 617. Dark Fire-cured Tobacco, by E. M. Matthews, B.Sc., Tobacco Adviser. Fire-curing Tobacco Barn, by the Tobacco Advisers.

No. 629. Notes on Flue-curing of Tobacco, by C. A. Kelsey Harvey.

No. 641. The Handling, Grading and Baling of Cured Virginia Tobacco, by D. D. Brown.

No. 644. Tobacco Baling Boxes, by B. G. Gundry, Irrigation Branch.

No. 653. The Care of Tobacco Seed Beds, by J. C. F. Hopkins, B.Sc. (Lond.), A.I.C.T.A. (Trinidad).

No. 661. Flue-curing Tobacco Barns, 12 ft. x 12 ft. x 16 ft., by B. G. Gundry.

No. 665. Tobacco Pests of Rhodesia, by Rupert W. Jack, F.E.S., Chief Entomologist.

No. 671. Wildfire and Angular Spot of Tobacco, by J. C. F. Hopkins, B.Sc., A.I.C.T.A.

No. 679. Tobacco Culture in Southern Rhodesia: The Harvesting and Curing of Virginia Tobacco, by D. D. Brown.

No. 689. The Lesser Tobacco Wireworms, by Rupert W. Jack, F.E.S.

No. 715. Turkish Tobacco Culture in Southern Rhodesia, by D. D. Brown, Chief Tobacco Expert.

No. 718. Preliminary Experiments on the Control of White Mould of Tobacco, by J. C. F. Hopkins, B.Sc. (Lond.), A.I.C.T.A., Chief Botanist and Mycologist.

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No. 748. Frog Eye Disease of Tobacco, by J. C. F. Hopkins, B.Sc. (Lond.), A.I.C.T.A., Chief Botanist and Mycologist.

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No. 784. Field Control of Frenching in Tobacco, by J. C. F. Hopkins, B.Sc. (Lond.), A.I.C.T.A., Plant Pathologist.

STATISTICS.

No. 196. Collection of Agricultural Statistics in Southern Rhodesia, by Eric A. Nobbs, Ph.D., B.Sc.

No. 209. The Agricultural Returns for 1914, by B. Haslewood, F.S.S.

No. 224. Statistical Returns of Crops in Southern Rhodesia for the Season 1914-15, by E. A. Nobbs, Ph.D., B.Sc., and B. Haslewood.

No. 230. Farm and Live Stock Statistics, 1915, by Eric A. Nobbs, Ph.D., B.Sc., and B. Haslewood, F.S.S.

No. 247. Statistical Returns of Crops Grown by Europeans in Southern Rhodesia for the Season 1915-16, by E. A. Nobbs, Ph.D., B.Sc., and Fred Eyles, F.L.S.

No. 259. Statistics of Live Stock and Animal Produce. 1916, by Eric A. Nobbs, Ph.D., B.Sc., and F. Eyles, F.L.S.

No. 281. Statistics of Crops, 1916-17, by F. Eyles, F.L.S.

No. 286. Statistics of Live Stock and Animal Produce for the Year 1917, by Eric A. Nobbs, Ph.D., B.Sc., and F. Eyles, F.L.S.

No. 303. Statistics of Crops, 1917-18, by E. A. Nobbs, Ph.D., B.Sc., and F. Eyles, F.L.S.

No. 322. Statistics of Live Stock and Animal Produce, 1918, by F. Eyles, F.L.S.

No. 361. Statistics of Live Stock and Animal Produce for the Year 1919, by F. Eyles, F.L.S.

No. 380. Statistics of Crops Grown by Europeans in Southern Rhodesia, 1919-20, by H. C. K. Fynn.

No. 393. Statistics of Live Stock and Animal Produce for 1920, by H. C. K. Fynn.

No. 409. Statistics of Crops Grown by Europeans in Southern Rhodesia for the Season 1920-21, by H. C. K. Fynn.

No. 426. Statistics of Live Stock and Animal Products for the Year 1921, by H. C. K. Fynn.

No. 443. Statistics of Crops Grown by Europeans in Southern Rhodesia for the Season 1921-22, by F. Eyles, F.L.S., and H. C. K. Fynn.

No. 459. Statistics of Live Stock and Animal Products for the Year 1922, by A. Borradaile Bell.

No. 484. Statistics of Crops Grown by Europeans in Southern Rhodesia for the Season 1922-23, by A. Borradaile Bell.

No. 527. Statistics of Crops Grown by Europeans in Southern Rhodesia for the Season 1923-24, by A. Borradaile Bell.

No. 543. Statistics of Live Stock and Animal Products for the Year 1924, by A. Borradaile Bell.

No. 580. Statistics of Summer Crops Grown by Europeans in Southern Rhodesia for the Season 1924-25, by A. Borradaile Bell, Statistician.

No. 595. Statistics of Live Stock and Animal Products for the Year 1925, by A. Borradaile Bell, Statistician.

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No. 646. Statistics of Live Stock and Animal Products for the Year 1926, by A. Borradaile Bell, Statistician.

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No. 421. From Breeder to Butcher; Cattle Feeding Experiment No. 9, Government Experiment Farm, Gwebi, by E. A. Nobbs, Ph.D., B.Sc., F.H.A.S.

No. 446. From Breeder to Butcher; Cattle Feeding Experiment No. 11, Government Experiment Farm, Gwebi, by Eric A. Nobbs, Ph.D., B.Sc., F.H.A.S.

No. 468. From Breeder to Butcher; Cattle Feeding Experiment No. 13, by Eric A. Nobbs, Ph.D., B.Sc.

No. 483. From Breeder to Butcher; Cattle Feeding Experiments Nos. 14 and 15, Government Experiment Farm, Gwebi, by Eric A. Nobbs, Ph.D., B.Sc.

No. 584. Merino Sheep in Southern Rhodesia, by H. W. Hilliard.

No. 624. The Construction of Dipping Tanks for Cattle (Revised).

No. 698. The Rearing of Bacon Pigs for Bacon Factory Purposes, by T. Hamilton, M.A., N.D.A., N.D.D.

No. 701. Feeding Bullocks at Gwebi, by S. D. Timson, M.C., Dip.Agric.

No. 719. Hand-rearing of Calves (Revised), by T. Hamilton, M.A., N.D.A., N.D.D., Dairy Expert.

No. 720. Fattening for Beef at the Gwebi Farm, by H. G. Mundy, Chief Agriculturist, and T. J. Needham, Accountant, Agricultural and Veterinary Departments.

No. 737. Fur and Wool-producing Rabbits, by Captain Edgar S. Everett, Hovere Farm, Banket.

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DAIRYING.

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No. 530. The Dairy Industry: Causes of Variation in Cream Tests, by T. Hamilton, M.A., N.D.A., N.D.D.

No. 562. Bacteria and the Dairy Industry, by J. R. Corry, B.Sc. (Agr.).

No. 567. Cottage Cheese, by J. R. Corry, B.Sc. (Agr.).

No. 572. The Pasteurisation of Milk and Cream, by J. R. Corry, B.Sc. (Agr.).

No. 577. Cream Cheese, by J. R. Corry, B.Sc. (Agr.).

No. 594. Milk Recording and its Advantages, by T. Hamilton, M.A., N.D.A., N.D.D. Introduction by J. R. Corry, B.Sc.

No. 606. The Production of Clean Milk, by T. Hamilton and J. R. Corry, Dairy Experts.

No. 667. Farm Cheese-making, by T. Hamilton, M.A., N.D.A., N.D.D., Dairy Expert.

No. 703. Dairy Buildings in Southern Rhodesia: Cow Byre—Type II., by B. G. Gundry, Irrigation Branch.

No. 711. Dairy Buildings in Southern Rhodesia. A Small Farm Dairy, by B. G. Gundry, A.I.Mech.E.

No. 717. Gouda or Sweet Milk Cheese-making, by T. Hamilton, M.A., N.D.A., N.D.D., Dairy Expert.

No. 730. Common Defects in Butter-making, by T. Hamilton, M.A., N.D.A., N.D.D., and J. R. Corry, B.Sc. (Agr.), Dairy Experts.

No. 752. Cheese as an Article of Diet, by T. Hamilton, M.A., N.D.A., N.D.D., Dairy Expert.

No. 785. Bacon Curing on the Farm, by T. Hamilton, M.A., N.D.A., N.D.D., Dairy Expert.

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No. 597. Suspected Poisoning of Stock: The Proper Procedure, by M. H. Kingcome, M.R.C.V.S. (Lond.), and A. W. Facer, B.A. (Oxon.), A.I.C.

No. 618. Notes from the Veterinary Laboratory: Quarter Evil, by Ll. E. W. Bevan, M.R.C.V.S., Director of Veterinary Research.

No. 642. The Laboratory Diagnosis of Animal Diseases, by Ll. E. W. Bevan, M.R.C.V.S.

No. 666. Notes from the Veterinary Laboratory: Præmonitus—Præmunitus, by Ll. E. W. Bevan, M.R.C.V.S., Director of Veterinary Research.

No. 723. A Method of Inoculating Cattle against Trypanosomiasis, by Ll. E. W. Bevan, M.R.C.V.S.

No. 739. The Laboratory Diagnosis of Animal Diseases: A Note to Emphasise some Points in the Preparation and Forwarding of Specimens, by D. A. Lawrence, B.V.Sc., Veterinary Research Officer.

No. 756. Parasitic Gastritis of Cattle, by Ll. E. W. Bevan, M.R.C.V.S., Director of Veterinary Research.

No. 760. A Note on Sheep Diseases in Southern Rhodesia, by D. A. Lawrence, B.V.Sc., Veterinary Research Officer, Department of Agriculture, Salisbury.

No. 772. Notes from the Veterinary Laboratory: Ophthalmia, by Ll. E. W. Bevan, M.R.C.V.S., Director of Veterinary Research.

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Parasitic Gastritis of Cattle, by Ll. E. W. Bevan, M.R.C.V.S., Director of Veterinary Research.

IRRIGATION.

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Banket Farmers' Association meeting, 5th July, 1930.

THE RHODESIA

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Editor - - *William E. Meade.*

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Editorial.

Contributions and correspondence regarding subjects affecting the farming industry of Southern Rhodesia are invited. All communications regarding these matters and advertisements should be addressed to:—The Editor, Department of Agriculture, Salisbury.

Banket Farmers' Association.—This association is of comparatively recent formation, having come into being some ten years ago. Farmers in the Banket area at one time used to attend the meetings of the Lomagundi Farmers' Association, but as the district became more closely settled it was decided to form a local association. The illustration on the opposite page gives an idea of the membership, although at the meeting in question there were a number of absentees.

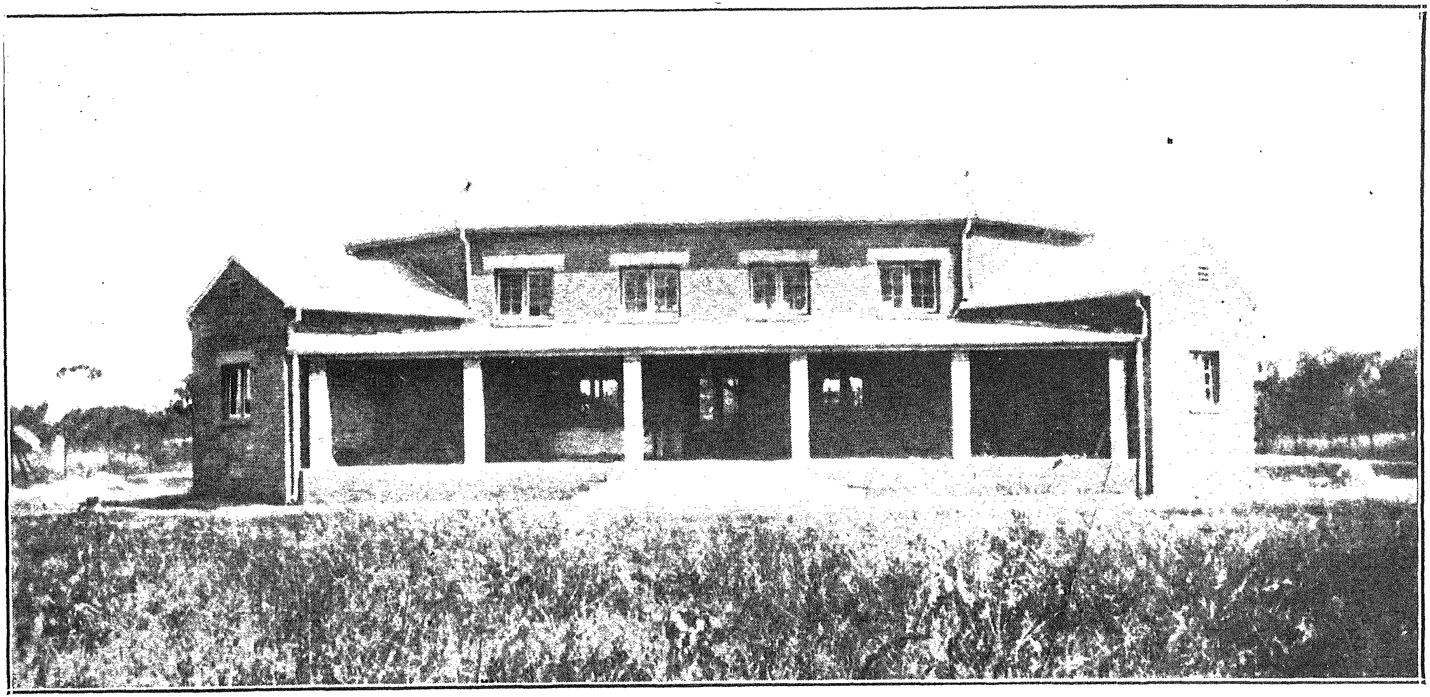
As will be seen from the other illustration, the Banket farmers have their own hall—a handsome and capacious edifice which was erected by the united efforts of the members. The hall has proved a great boon to the farmers of the district, and is used for a variety of purposes, social and otherwise. Three tennis courts have been constructed

and afford the younger members of the association an opportunity of proving their prowess at this popular game. It is whispered that the counter-attraction of the courts has at times visibly affected the attendance at the monthly meetings, but we feel sure that the president, Commander R. M. Knight, and the capable secretary, Mr. A. M. Hutchinson, will deal adequately with such a situation, should it be necessary.

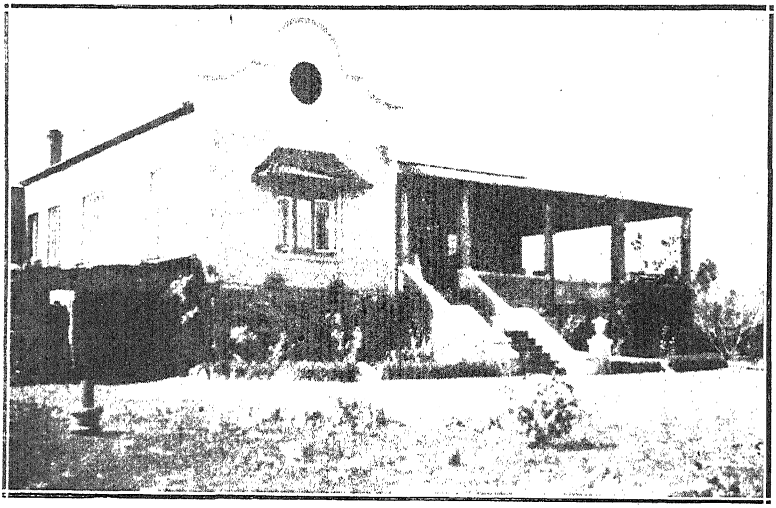
Banket is one of our principal maize-growing areas, and excellent crops are grown on the rich red loam typical of the farms in the vicinity of the railway. Yields up to 12 and 15 bags are quite common, and this year it is expected that some 90,000 bags will be reaped in the district. Mixed farming is generally practised, and farmers will not feel the effects of the slump in prices so severely as their confreres in less favoured districts. Cotton has proved itself a useful rotation with maize, and good crops of the U. 4 strain have been grown on a number of farms this season. Boll worm has taken its toll, and but for this pest remarkable yields would have been recorded. The fattening of cattle for local and other markets is receiving increased attention, but the present difficulty is to obtain suitable bullocks for the purpose, and herein would appear to be an opportunity for the Umvukwe ranchers.

Towards the north-east, as the Maquadzi River is approached and beyond, the soil merges into "contact" and granite formation, and here are located a group of Empire settlers whose activities have been principally concerned with the growing of tobacco, for which the soil is eminently suited. Excellent crops have been grown, and but for the fact that production has temporarily outstripped market requirements, substantial profits would have rewarded the efforts of the settlers. They are still growing tobacco, but are also successfully turning their attention to other lines, such as maize, cotton, ground nuts, dairying, pig raising and poultry, and are making a valiant attempt to establish themselves in their holdings. We hope and believe that many of them will succeed.

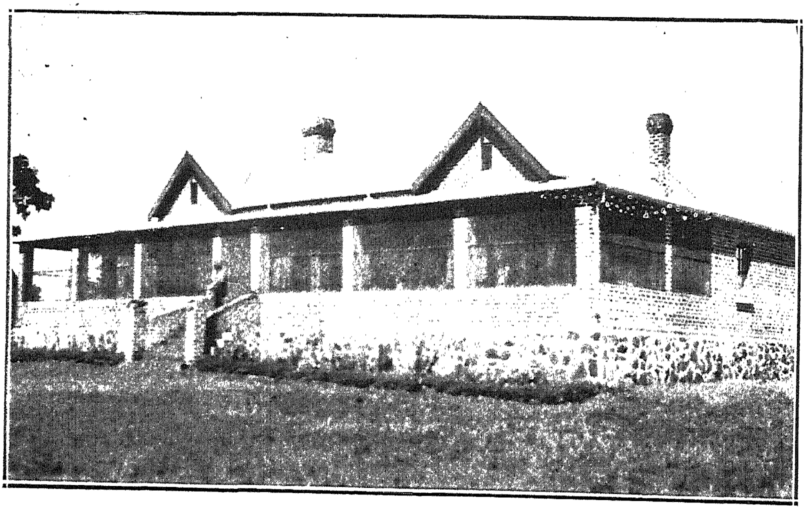
The carob bean tree (or locust bean) illustrated on the opposite page is one of a group of twenty growing on Mr. W. McFadzean's farm Bauhinia. The seed was sown *in situ*



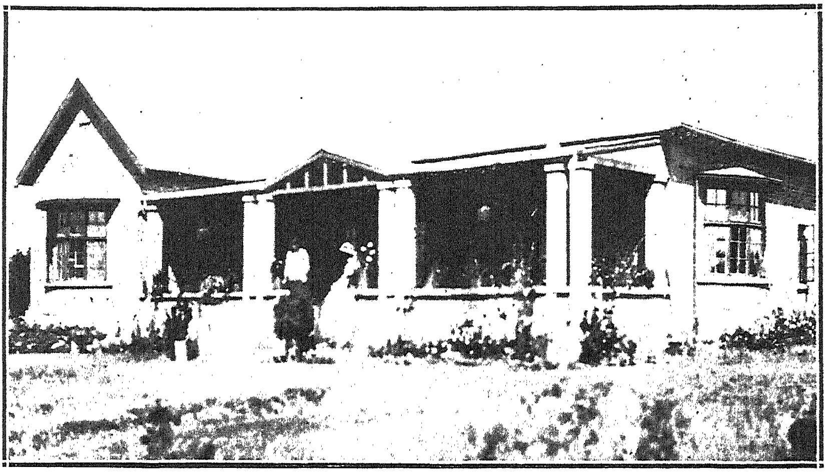
Farmers' Hall, Banket.



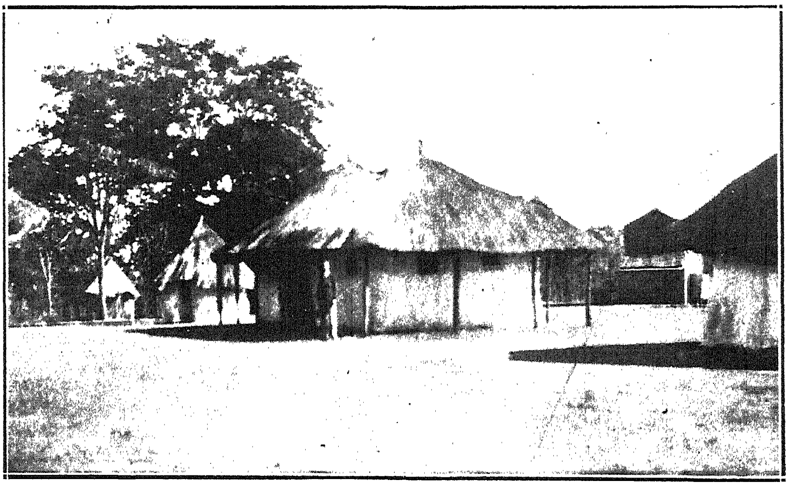
Homestead of Mr. C. Selby Larter at "Highlands," Banket.



Homestead at "Dunphaile," Banket (Mr. W. A. Beattie). This is Type No. IV. Government farm homestead slightly modified.

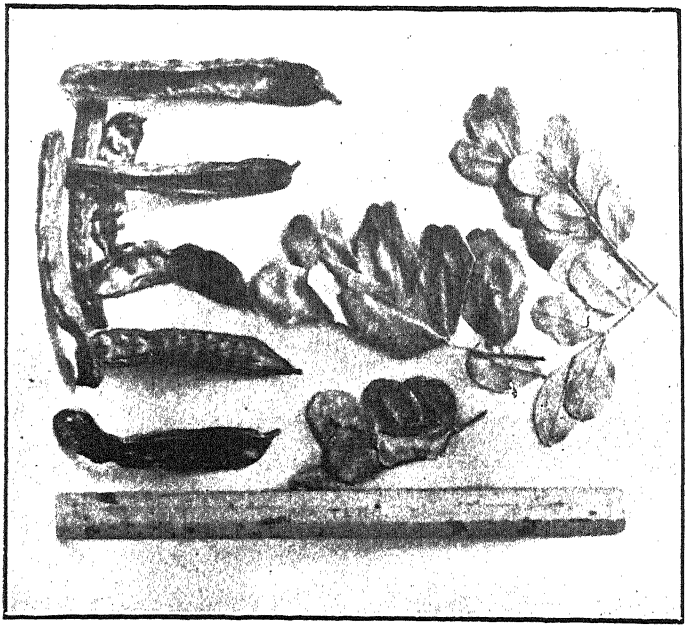


Homestead at Weston Park, Banket (Mr. W. H. Dodds).



An Empire settler, Mr. T. R. Johnson, Northwood Estate, Maquadzi Area, Banket.

Orchard of carob bean trees at Mr. W. MacFadzean's farm Bauhinia, Banket.



Pods and leaves of the carob bean tree.

$5\frac{1}{2}$ years ago, and the trees are now mostly bearing. The pods of this tree have a high feeding value, being equal in nutrients to barley and superior to oats for feeding and fattening cattle, sheep, pigs and horses. One or two of Mr. McFadzean's trees bore last year, and he ground the pods and gave them to his cows mixed with mealie meal. The cows ate it with relish.

It will be remembered that an article on the carob bean and other pod-bearing indigenous trees of value for stock feed appeared in the *Rhodesia Agricultural Journal* for October, 1924, the writer being Mr. J. A. T. Walters, B.A., late Agriculturist of the Department of Agriculture and now farming in the Enterprise district.

The tree is growing at the present time in the Umtali, Victoria, Bulawayo and Banket districts, and was first introduced into Southern Rhodesia at the Matopos Park from seed obtained from the Cape Colony some 20 years ago. The carob bean is a source of great wealth in Southern Europe and is cultivated very extensively in the Mediterranean countries generally, thousands of tons of the pods being sold annually to the northern countries and to America for cattle food, and even as a sweetmeat for human consumption under the trade name of "locust beans." The tree appears to thrive in this Colony and is worthy of greater attention by our farmers.

There are many pleasant homesteads in the Banket district, signs of the substantial progress which has been made in the past few years. Most of the farmers are for the present "marking time," in the sense that they are going slow and hoping for the present period of depression to pass. When it does we may expect to see an even more rapid advance than has been characteristic of the past.

Export of Live Cattle to England.—In the last issue of this Journal we gave some figures showing the net realisation of a consignment of ten head of cattle sent from the Gwebi Farm to England per s.s. "Clan McKenzie" in April last. In the same article we stated that on one shipment there was a loss of £54 17s. 2d. This is not correct.

The 20 cattle referred to as sent by Mr. H. Taylor were the property of the London and Rhodesian Mining and Land Company, Limited, and were bred on their ranches. The gross realisation for these animals, including the bounty, was £632 3s. 7d., from which must be deducted £291 8s. 10d. for railage, freight, insurance and expenses. Thus the net realisation was £340 14s. 9d., equal to £17 0s. 9d. per head. This consignment was in the nature of an experiment, and we understand that in view of its results, the company has arranged to make regular large annual shipments in future.

A further shipment of 160 Rhodesian cattle for Birkenhead left Capetown per s.s. "Clan Malcolm" on the 31st May, all arriving in excellent condition and without any casualties. Particulars of the financial results were published in the daily Press. The prices realised were not so good as those of the former shipment, the net proceeds for 133 head, including the Government bounty, being as follows:—Mr. A. L. Millar, 25 head, £11 2s.; Gwebi Farm, 15 head, £11 2s. 5d.; Mr. C. C. Macarthur, 10 head, £13 3s. 4d.; Mr. W. H. Rogers, 20 head, £9 2s. 11d.; Matopo Farm, 30 head, £10 6s. 7d.; Mr. J. R. Stewart, 33 head, £10 10s. 8d.

Loans to Farmers for the Purchase of Stock.—During the period August, 1925, to 30th June, 1930, the amount of £53,174 14s. 3d. has been advanced by the Government to farmers of this Colony for the purchase of stock. The total is made up of £36,369 19s. 9d. for 2,603 cows, £12,796 9s. 8d. for 262 bulls, £3,307 7s. 7d. for 2,736 sheep, £453 10s. 9d. for pigs, £187 6s. 6d. for poultry and £60 for 15 donkeys. The bulls purchased were 91 Frieslands, 61 Shorthorns, 26 Herefords, 22 Red Polls, 16 Ayrshires, 16 Devons, 11 Aberdeen Angus, 10 Sussex, 8 Lincolns and 1 Jersey. Of the cows purchased, 1,515 were Frieslands, 512 Shorthorns, 163 Ayrshires, 136 Red Polls, 108 Grades, 77 Devons, 41 Herefords, 32 Aberdeen Angus, 18 Lincolns, 1 Jersey.

Further provision was made in the current year's estimates for loans for the purchase of live stock, and application should be made to the Secretary, Department of Agriculture, Salisbury, who will supply full particulars as to the condi-

tions under which loans are made. It should be noted that advances to purchase stock will not be made until the accommodation and feeding arrangements for the animals have been inspected and approved by a veterinary surgeon, cattle inspector or other official appointed by the Department for the purpose. Further, that before any payment of a loan is made on behalf of an approved applicant, he is required to deposit with the Department of Agriculture 25 per cent. of the purchase price of the live stock required. The first repayment of the loan need not be effected until twelve months from the date the vendor's account is paid, and the whole amount of the loan has to be liquidated within four years of the date of purchase of the live stock. Interest is charged at the rate of 6 per cent. per annum on the amount outstanding, and this is payable each quarter. Loans are limited to £150 for the purchase of a bull, £250 for dairy cows and £150 for small stock.

The Rhodesia Railway Administration allows a rebate of 50 per cent. off the railage paid for grade cows, sheep and pigs over their lines north of Mafeking when the live stock is purchased under the loan scheme. As regards pedigree stock purchased under the scheme, a rebate of 50 per cent. is allowed off the railage paid from station to station, provided a rebate certificate is produced from the secretary of the South African Stud Book Association certifying that the cattle purchased are registered animals.

Rothamsted Experimental Station.—This station, the father of all agricultural research institutions, was founded in 1843 by the late Sir J. B. Lawes, with whom was associated Sir J. H. Gilbert for a period of nearly 60 years. Lawes died in 1900 and Gilbert in 1901; they were succeeded by Sir A. D. Hall from 1902 to 1912, when the present director, Sir E. J. Russell, was appointed.

For many years the work was maintained entirely at the expense of Sir J. B. Lawes, at first by direct payment, and from 1899 onwards out of an annual income of £2,400 arising from the endowment fund of £100,000 given by him to the Lawes Agricultural Trust. In 1904 the Society for Extending the Rothamsted Experiments was instituted for

the purpose of providing funds for expansion. Since then financial assistance has been given through the medium of private and Government grants, and the result is that the station is able to deal with problems affecting modern farming in a far more complete manner than would otherwise be possible.

The purpose of the Rothamsted work is "to discover the principles underlying the facts of agriculture and to put the knowledge thus gained into a form in which it can be used by teachers, experts and farmers for the upraising of country life and the improvement of the standard of farming." The activities of Rothamsted are not confined to the British Isles, but are gradually spreading out to the Empire and other countries abroad. The International Education Board sends workers from all parts of the world to study in the Rothamsted laboratories, and it is interesting to note that in 1929 the Rhodesian Government availed itself of these facilities. The Empire Cotton Growing Corporation has since 1923 made a grant of £1,000 per annum for the development of investigations in soil physics, while the Empire Marketing Board has recently invited the co-operation of the station in solving certain agricultural problems of great importance to the Empire.

The Rothamsted investigations are concerned mainly with crop production; they include soil management, the use of fertilisers, plant diseases and the value of the resulting crop. The report for 1929, which has recently reached us, is a document of 125 pages and a comprehensive record of work proceeding on the lines indicated. We do not propose to attempt to describe the work in progress, but one instance may suffice to convey an idea of the practical nature of the activities of the station. One of the most important problems in England to-day is the provision of cheaper winter food for live stock. The present position is that "starch equivalent" can be purchased for 1d. per lb., while "protein equivalent" costs 1½d. per lb. The problem set at Rothamsted was: At what expenditure on fertilisers can a farmer produce these foods and substances on his own farm? The average result of the trials was that for an expenditure on fertilisers of between 10s. and 20s., using barley as the crop —a most efficient transformer of cheap fertilisers into food—

and 1 cwt. sulphate of ammonia per acre as a dressing, it is reasonable to expect a return of—

26 lbs. protein equivalent, worth about ...	3s. 2d.; and
312 lbs. starch equivalent, worth about	26s. 6d.
In all, food substance worth about	29s. 8d.

The following extract from the report serves to illustrate the economic trend of agriculture in Great Britain:—"The agricultural conditions of Great Britain differ from those of various other countries, in that they do not, and for years past have not, stimulated the British farmer to increase his yields per acre. During the writer's visits overseas the question almost always asked by farmers is, 'Can you tell us how to get more produce out of our land?' But it is rarely asked here. The desire to create wealth in the countryside, which was a potent factor in the life of the nineteenth century, seems less operative now. 'I can't profitably sell what I grow now, so what is the use of growing more?' is the usual comment. . . . Instead of seeking information about increased yields, farmers usually ask how to reduce costs of production. The most important problems now in agricultural production are those associated with grass land, winter fodder crops and highly priced crops such as sugar beet, potatoes and malting barley. To these problems, therefore, considerable attention is now being paid at Rothamsted."

The report is obtainable from the Secretary, Rothamsted Experimental Station, Harpenden, Herts, England, for 2s. 6d., plus postage.

Tobacco Production in Canada.—We have received a copy of the report of the officer in charge of the Tobacco Division of Canada for the years 1927, 1928 and 1929, from which we see that in the year 1929 Canada produced 29,886,350 lbs. of tobacco as compared with 41,956,375 lbs. in 1928 and 43,916,700 lbs. in 1927. Of the 1929 production, 10,500,000 lbs. were bright flue-cured, the remainder mainly being Burley, 7,806,000 lbs.; cigar leaf, 5,003,850 lbs.; dark fire-cured, 2,600,000 lbs.; and large pipe, 2,610,000 lbs. The yield per acre of flue-cured tobacco was 696 lbs.; in 1928 it was 800 lbs. per acre.

The outstanding feature of tobacco production in Canada during the past three years has been the increase in the acreage devoted to flue-cured leaf, which is grown in Ontario. Despite this fact, Canada is still obtaining the bulk of her requirements of this type of leaf from the United States, from whence 18 million pounds were imported in 1929. We suggest that the Canadian market is well worthy of investigation as an outlet for Rhodesian bright leaf, especially in view of the fact that it enters Canada untaxed. Canada is endeavouring to build up an export trade in tobacco, her principal market at present being the United Kingdom, which in 1927 took 5,859,120 lbs. of leaf, in 1928 6,133,481 lbs., and in 1929 5,809,207 lbs. Most of the tobacco sent to the United Kingdom from Canada consists of heavy red leaf grades of Burley, with smaller quantities of dark fire-cured wrappers and dark fillers. In 1929 small lots of bright flue-cured and cigar leaf were exported to Great Britain. A notable feature is the development of trade with other European countries for low grade leaf. For instance, in 1929 1,165,870 lbs. were sent to Belgium, 84,501 lbs. to the Netherlands, 78,509 lbs. to Germany, 56,316 lbs. to Denmark and 44,858 lbs. to Spain.

The possibilities and requirements of the British market have been investigated very thoroughly by Canadian commissioners, and it was found that what the trade required was flue-cured tobacco suitable for cigarette manufacture. It is stated that, "due to its characteristic mildness and sweetness of aroma, the most desirable leaf at present comes from the 'New Belt' in the United States. No Empire-grown leaf has yet been found which could wholly replace this tobacco, but the general consensus of opinion appears to be that Canadian flue is the closest to the American leaf of any grown in the Empire. Because of the distinctive flavour of the Canadian flue, careful blending is necessitated. The Rhodesian product, while very mild, has an even more distinctive flavour and 'tang' than the Canadian. The soundness and burning qualities of the Canadian-grown flue appear to be fairly satisfactory."

Twenty-four British firms, including leaf importers, brokers and manufacturers, were interviewed to obtain their opinion on Canadian flue-cured leaf. Of these, about half

the firms expressed varying degrees of satisfaction with the general quality of Canadian flue-cured, either for cigarettes or pipe mixtures. The chief criticisms were: (1) midribs too prominent; (2) leaf somewhat harsh; (3) coarse; (4) lacking in flavour; (5) too much sand, dirt and scrap; (6) poorly graded. The conclusion drawn from these by the writer of the report is that while Canadian flue-cured tobacco is not entirely satisfactory, yet it is sufficiently good to use in either cigarette blends or smoking mixtures.

On the matter of grading it is stated that Canadian tobacco in the past has not compared favourably with leaf from the United States and Rhodesia. "One of the noticeable features of both American casks and Rhodesian bales was their uniformity in colour and length."

The Tobacco Division of the Department of Agriculture of Canada has evidently enquired fully into the matter of markets, for reports have been received on the possibilities for Canadian leaf in British Guiana, British Honduras, British West Indies, Australia, India, New Zealand, Union of South Africa, Argentina, Czecho-Slovakia, Denmark, Germany, Italy, Japan, Netherlands, East Indies, Norway and Sweden.

As a result of difficulties encountered by growers in the sale of the 1926 and 1927 crops, a commission was appointed by the Government early in 1928 to report on conditions in connection with the tobacco-producing industry. It was found *inter alia* that the domestic and British markets constituted the best outlets for Canadian-grown leaf. On both these markets it was considered that leaf quality was a most important factor, and the commission recommended that every possible effort should be made to improve the quality of the Canadian product.

The remainder of the report deals with the experimental work of the Tobacco Division, showing that every effort is being made to carry out the recommendations of the commission.

Making a Garden in Rhodesia.

HINTS FOR BEGINNERS AND NEWCOMERS.

(Continued.)

By Mrs. E. M. V. Carnegie.

The Herbaceous Borders.—Now we come to what is in some ways the most difficult part of the garden, and in others the easiest. Easy, because herbaceous things grow very readily; and difficult, because there are so many lovely things to put in and it is quite impossible to have them all. Also the choice must be made as to just how we want to arrange the things we select. Some people like ribbons of colour, others prefer masses of one kind grown together, and still others like variety and a mixture of everything. Each must decide for himself. A well-planned garden will have a succession of flowers all the year round, for we are blessed in Rhodesia with a climate that makes this possible and comparatively easy. When the choice of seeds has been made and they are growing in their tins and boxes, we can turn our attention to the preparation of the beds and borders where they are going to live later on.

First of all the soil must be trenched to at least two feet and a good layer of manure put at the bottom, exactly as was done with the roses, and the soil mixed with wood ash, decayed vegetation and manure before being put back into the trench. It is a good plan to do this not only in a brand new garden, but occasionally in an established garden as well, for soil that has been giving of its best for two or three seasons gets tired and needs rejuvenating. As a rule amateur gardeners are in too much of a hurry and do not pay enough attention to this preparation of the soil. They are so anxious to see a few flowers blooming that they do

not trouble to give them the best possible conditions, though by *not* doing so they give themselves much more trouble in the end, for unworked soil gets dry and hard much more quickly than that which has been properly prepared. It is well to remember that soil thoroughly worked and prepared can hold a great deal of moisture, and that moisture is essential to growth.

How often have you seen grave-like mounds dug over and planted, and nothing else done to them! That is what a native will do every time if it is left to him, with the result that the water runs *off* instead of *in*, and very soon the ground is as dry as a bone again. The poor plants make a desperate effort to produce a few very indifferent flowers, then give it up and quickly pass out. The next thing you hear is a complaint of the seed, the bad soil, etc., and such remarks as, "The weeds grow fast enough, but nothing else will." Of course the weeds grow, and the native trees and bushes too. They are indigenous, and that is the kind of soil they like. But for the flowers we love and have brought with us from very different climates, things are not so easy. They certainly are more or less acclimatised, but even so, they cannot live and thrive unless we give them the conditions they need any more than a little white child could thrive under native conditions. So let us prepare our soil well and stint neither time nor labour in the making of a garden that is to be a continual source of pleasure, for you can rest assured that we shall get far more than we give.

Probably the question most often asked by the newcomer and the beginner is, "What can I sow now?" And it is a very important thing to know. Many and many a packet of seed has been wasted by being sown at the wrong time. Our seasons do not correspond exactly with those of the south, and we have, as a rule, much less frost and much heavier rains, so we need a garden time-table all to ourselves.

When to Sow.—Hardy annuals which only live for one season, but are the most easily grown of all plants, may be sown at any time from August to April. If they are sown in successive months they will provide an almost continual supply of bloom. They may be sown in the open ground, but are more satisfactory if started in tins or boxes, thinned out and afterwards transplanted.

Just one or two, however, make an exception to this rule, and object strongly to being handled. These must be humoured and sown where they are to flower. They can be thinned out when about six inches high and the superfluous ones put in somewhere else, though it is more than likely that they will not thrive and will probably always be stunted, even if they condescend to grow. These are all fairly well known, and include clarkia, hunnemannia, flax (scarlet and blue), nemophila, poppies, sunflower and sweet sultan. Other hardy annuals are ageratum, anchusa, coreopsis, candytuft, carnation, cornflower, cosmos, dianthus (pinks), gypsophila, godetia, morning glory, larkspur, lupin, linaria, mignonette, nasturtium, nicotiana (tobacco plant), nigella (love-in-the-mist), nemesia, pansy, petunia, phlox drummondi, salpiglossis, scabious, statice, stock, sweet peas, verbena. The culture of all these is easy, though some require a little extra care.

Carnations must have good drainage, and produce finer flowers if given a little chicken manure or bone dust occasionally. Also, all side buds--and they produce dozens—should be taken off and no faded flowers allowed to remain on the plant. If they are properly cared for they will go on blooming for months and months. They can be increased by cuttings and layerings, though more flowers are obtained from those grown from seed.

Pansies like a little shade and are grateful for a dressing of lime. They really look best if grown in rows, like good little children sitting on benches in school, and make an excellent border.

Nasturtiums will grow anywhere and really seem to pride themselves on being able to produce a wonderful splash of colour, even in poor soil. They should be in every garden, and lots of them.

Sweet Peas require special care to enable them to produce their most beautiful blooms. Winter-flowering sweet peas are more satisfactory than the summer-flowering in this country, as they do not get spoilt by rain. They should be sown in a mixture of loam and well-rotted manure, for they require to be well fed from the very first. This is another exception in hardy annuals, for they should be sown in March at the earliest.

All dark seeds should be soaked for twenty-four hours before sowing, as they take much longer to germinate than the paler seeds and have much tougher skins. When they are big enough to handle, the seedlings should be transplanted into a trench specially prepared for them in an open situation, for they must have plenty of light and air. They like also a deep rich soil and plenty of moisture, and when they are about four inches high they should have small branching sticks on which to support themselves. These must later on be replaced by taller ones as the plants grow. They do very well on a light fence or on wire netting, but do not like anything which excludes air and light. When they show signs of flowering they should be given manure water at least once a week and kept always moist. In cold weather they should be watered only in the middle of the day, and then with water slightly warm, for they are very sensitive things and might easily get a shock from too cold water.

If the flowers are picked before they are quite open in the early morning, they will last a very long time in water and will not lose colour, as they often do in the full sunshine of the garden. They should be cut every day and never allowed to go to seed till the very end of the season.

Half hardy annuals should all be sown in boxes, with the exception of balsams, about August and early September, and planted out into the garden at the time of the early rains. Some of the best known are:—

Amaranthus, which makes a glorious show for months on end, is a large and bushy thing and makes a splendid background to a border and is lovely grown in clumps.

Asters like an open aspect and plenty of lime and manure, also an addition of wood ash dug into the soil round about them. If sown in successive months, they will flower nearly all the year round. It is better to sow the dwarf varieties to bloom in the dry season and the tall ones in the rains, for the smaller kinds are often completely bedraggled and spoilt in wet weather.

Portulacca loves the sun and is good on rockeries or among stones, as it does not need either very deep or very rich soil. There are single and double varieties, all lovely and of very many shades of colour, and they will grow just anywhere.

Zinnias are a joy and a delight. They are of many kinds and every imaginable colour, seed themselves very freely and continue to produce good flowers for two or three seasons from self-sown plants. They will grow in poor soil, but are very much finer where they are well looked after and given plenty of manure and moisture. They produce a blaze of colour that is scarcely equalled by any other flower, and are fine for cutting.

Other half hardy annuals are:—

Arctotis—a bluey-mauve daisy with grey-green foliage—very easily grown and very pretty.

Balsam, cockscomb, Chinese lantern, bluelace flower, lobelia, marigold and gilia are well known and easily grown.

Biennials follow a law of their own in this country. They are supposed to produce leaves the first season and flowers the second, and then to die down. In reality they do nothing of the sort, for if the seeds are sown early in autumn, about April or May, and transplanted in August, they flower in about eight months and continue to bloom for a very long time. The best known varieties are Canterbury Bells, which do well, Sweet Williams and Wallflowers. Wallflowers are difficult and not very satisfactory, generally producing plenty of leaves and a very few flowers. They need not be condemned, however, for it is possible that they may do for some people what they will not for others. Flowers are like that, and you will often find one person very successful with a particular kind of flower, whereas the next door neighbour will not be able to grow them at all.

Perennials are those plants which die down every year, but come up again from the same root stock every spring. They include some of the finest flowers in the garden and are most satisfactory things to grow. Their seeds often take a very long time to germinate and are best sown in tins under glass, which must be removed as soon as the seedlings appear. Autumn is the best time to sow them, and when they are big enough they should be transplanted into other tins and boxes, giving each seedling plenty of room to grow before removing it to its permanent place in the garden. You must be prepared to wait for three or four months for some of the very slowest to germinate—violet, phlox and perennial poppies taking about the longest time. Don't

disturb the soil to see if they are growing and don't make them too wet, though they must always be moist.

The Barberton Daisy and its hybrids are very difficult to raise, and generally speaking only one or two can be obtained from a whole packet of seeds. But once you have them you can divide them again and again, and they make such a show that they are well worth the trouble of growing. The seed should be planted with the pointed end just showing above the soil.

Delphiniums also are rather difficult, but repay one handsomely for any trouble they give. They are sometimes called the perennial larkspur, but make a very much bigger plant and should be placed at the back of the border, as they sometimes attain a height of five or six feet.

Cannas should have the covering of the seed filed or cut open before they are sown, as they are very tough and leathery even if soaked for twenty-four hours. They make a magnificent show grown in groups, with their luxuriant green or red foliage and flowers of many colours, ranging from cream to deepest yellow or red, through all the shades of peach, apricot and pink. They multiply rapidly and want lots of room. At the end of a season a dozen plants can quite easily be divided into a hundred, as every bit of root that has sent up a stalk will grow separately if it is replanted as soon as divided.

Antirrhinums are great favourites and deserve a place in everyone's garden. There are tall and dwarf varieties and a great number of different shades.

A border of "Yellow King" and "Golden Monarch" or "Victory," with the pale blue salvia (salvia farinacea) between the rows, is a most wonderful sight. "Yellow King" is a very tall kind, of a fine deep yellow, and would show well above the salvia, the other yellows being intermediate or dwarf kinds to be grown in front.

So many combinations of colour are possible that a very striking display could be had with antirrhinums alone. They are sold in separate packets or in mixed shades, and many individual flowers combine shades of them all.

Dahlias may be grown from seed, though it is more usual to plant tubers and more satisfactory if you want any

particular kind, as you can never be sure what you are going to get when you sow the seed. The plant produced may be like the parent plant or it may be something that has never been seen before. You just have to wait and see; and you will find that most seedsmen and florists mark their packets of dahlia seed "Mixed" because they cannot guarantee any of them to come true to type.

Aquilegia—the long-spurred variety of Columbine—*Shasta* and *Michaelmas Daisies, Foxglove, Geum, Heliotrope, Phlox, Pyrethrum, Salvias,* in four or five varieties, and *Violets* all grow readily. Violets grown as a border in the open sunshine will produce dense masses of leaves and beautiful long-stemmed flowers in June and July. They do not require shade so long as they are well manured and watered night and morning. They should be taken up every year about January and the roots divided and re-planted. They multiply very rapidly and have the advantage as a border plant of being evergreen.

Another pretty bordering is henchera. This is a small plant with leaves like a geranium and coral-red flowers on long stems which continue to bloom a very long while.

The most popular of all borders, however, is alternanthea, which forms a box-like edging and can be kept clipped and tidy. It is red and green or green and white, and grows very easily and rapidly, every little bit taking root at once. It should not be allowed to flower, or it becomes straggly.

How to Sow.—It is more satisfactory to sow all the smaller seeds in tins or boxes and not to transplant into the open ground until the seedlings are at least four or five inches high, otherwise you run the risk of having them washed out or buried by a heavy rain; and if this does not happen the big black ant will probably come along and nip them off before they can get established. He is a gourmet, and seems only to like them when they are young and succulent, for he leaves the bigger ones severely alone.

In preparing the seed boxes or tins—the ubiquitous paraffin tin cut lengthwise does excellently—first make sure that there is plenty of drainage by making a number of holes in the bottom. Then fill them one-third full of stones or broken brick before putting in the soil.

A mixture of leaf mould, loam and sand is as good as anything, or the earth from a vlei or dambo mixed with the original garden soil in the proportion of two to one.

The boxes should be kept in a sheltered corner of the garden where they will get the morning sun, and should be kept always moist though not wet. The seed should be sown thinly and not too deeply. Many and many a batch of seedlings have been smothered before ever they came through the soil. The tiniest seeds need barely covering; others should be covered to twice their thickness, which is really very little when you come to think of it. The earth must always be pressed down firmly after sowing so that the seedlings do not dry up before their roots can get firm hold of the soil, and from the time they are sown until they have germinated, no matter how long they take, they must never be allowed to become dry. On the other hand, they must not be made too wet or they will be weedy or delicate, grow very tall and then damp off. This applies very specially to carnations. It is a great help to have some native mats of split cane that can be cut to the size of the boxes and used as shades. These will help to keep the soil moist, but should gradually be discarded as the seedlings grow strong. Should heavy rain be threatening, the mats should be arranged in such a way that the water will run off them and not drip through.

As soon as the seedlings are big enough to handle they should be thinned out into other boxes or tins, an inch or two apart, and kept shaded till they have settled down again. The smaller and weaker ones should be specially cared for, as they very often produce the best blooms, while the more robust plants run to leaves.

Give them more air and light day by day, so that by the time you want to transplant them into the garden they are quite strong and hardy. Choose a dull day if possible for transplanting, or else do it in the evening so that they get the cool of the night to establish themselves. Water them in the boxes, then lift them out carefully, keeping as much earth as possible round their roots, and press the garden soil very firmly about them. Keep them shaded for a day or two and they will scarcely know that they have been moved.

If the plants are given manure water occasionally, they will bloom for a longer time and have much finer blooms, both in size and colour. Once a week is often enough, and in the intervals of watering, the ground should be loosened and dug over in dry weather, but never when it is very wet, else the plants catch cold and die. This dry cultivation is very important, as it helps to conserve the moisture, lets air into the soil and discourages the white ant.

Bulbs.—Many flowers which grow from seed can also be procured in the form of a bulb and come more quickly into flower when planted thus.

Some are more suited for planting in autumn and others in late winter or very early spring. The favourite of all is perhaps the *Gladiolus*, of which there are two or three hundred varieties. They should be planted in February or March for winter flowering and again in the spring, about September, to flower in the summer. Indeed, they may be had the whole year round by planting a few each month, provided there is not much frost.

A light loamy soil with good drainage suits them best, and they may be left in the same place for two or three years. After this period all bulbs should be taken up and the smaller ones that have formed around them removed to make new plants. Both new and old should have a period of rest—say, two or three months at least. When taken out of the ground they should be spread out in a dry and shady place, after being cleared of earth, etc., and left for a fortnight, then packed away in dry sand till they are wanted again. The variety is amazing and the choice bewildering, and every flower as it opens is a surprise and joy.

The Amaryllis grows very easily and multiplies quickly. It can be had either red or pink and looks lovely grown along the edge of grass or under trees. It has the advantage too of lasting a very long time in water when cut.

Arum Lilies, white or yellow, are usually grown in pots or tins, but do equally well out of doors. They do not need very fine soil, but must be kept fairly moist.

The Madonna Lily grows readily in a partly shaded position, and looks lovely with a background of delphiniums.

There are many different kinds of *Iris*, and they make a wonderful show. The Japanese Iris, Flag Iris and the new Orpington Iris are all very well worth a place in the garden, and as they are not very tall, look well as a border to the gladiolus bed, especially as they bloom at the same time. These should all be planted in the spring—the earlier the better.

For winter flowering we have, as well as gladioli, agapanthus, anemones, spider lilies, freesias, ranunculus, ixias, watsonias, zephyranthes and chinkerinchees. Narcissi of all kinds and hyacinths can be grown, but are apt to be disappointing. They seem to need the combination of cold and moisture which most fortunately we do not often get. The single varieties do better than the double, though neither make much of a show and are best grown in pots if they are tried at all.

The tubers of *Dahlias* should be taken up every year when the stem has decayed and stored in a dry place from May or June till the following October. Unless this is done, the flowers very quickly deteriorate.

(To be continued.)

REDUCED FREIGHT ON GROUND NUTS.

The Department of Agriculture has received information of a reduction in the freight rates on ground nuts between Beira and London.

Last October there was a meeting at the High Commissioner's office in London to discuss the question with the Conference Lines. The old rate has been 86s. 9d. a ton for unshelled nuts and 47s. 6d. for shelled nuts.

As a result of the discussions, the Conference Lines have agreed to a reduction of 10s. a ton as regards unshelled nuts—from 86s. 9d. to 76s. 9d.—while the rate for shelled nuts has been reduced to 44s. 3d., subject to 10 per cent. deferred commission and also less shipping charges, 6s.

The Army Worm.

(*LAPHYGMA EXEMPTA*, WLK.)

By RUPERT W. JACK, Chief Entomologist.

The widespread outbreak of "Army Worm" which occurred during the early part of January of the present year (1930) and covered practically the whole of the maize-growing area of the Colony has indicated the need for a comprehensive article dealing with this important pest. Immediate action is absolutely necessary in dealing with outbreaks of this insect, and, where every hour is of importance, it is clear that the farmers should be armed with all available information so that action can be taken without the necessity of applying to the Department for advice.

The insect in reference is known as the "Army Worm" throughout the Colony, and is in fact a close relation of the so-called "Fall Army Worm" (*Laphygma frugiperda*, S. & A.) of the United States of America. In the Union of South Africa it is commonly termed the "Mystery Worm" or "Army Mystery Worm" in reference to the mystery which surrounds its sudden appearances and disappearances.

The name "Army Worm" refers to the habit the caterpillars have of advancing in one direction in very large numbers when food becomes scarce on their primary feeding grounds or possibly in response to some other stimulus. In the Union of South Africa a related species, namely, *Laphygma exigua*, Hubn, occasionally develops the "army" habit and is there termed the "Lesser Army Worm." This species also occurs in the United States of America and is known as the "Beet Army Worm." The same insect is also a common pest in Southern Rhodesia, but has not so far been recorded in reference to "army" movements.

Distribution.—The Army Worm (*L. exempta*), although certainly indigenous to Africa, is also recorded as a pest

as far away as Queensland, in Australia, where it attacks sugar cane and other crops. It is not recorded, at least as a pest, in any of the intervening countries. In Africa it is recorded as destructive at times in Nyasaland and Tanganyika, in addition to the South African Union and Southern Rhodesia.

Outbreaks are also apparently not infrequent in Portuguese East Africa.

Description of Stages.—*The Parent Moth.*—It is a common mistake amongst residents in the Colony to regard the white butterflies (chiefly *Catopsilia florella*), which frequently migrate in large numbers in a more or less south-westerly direction during the early part of the rains, as the parents of the Army Worm. The caterpillars of these butterflies feed on certain native plants, particularly shrubs of the genus *Cassia*, and are quite distinct from the subject of this article.

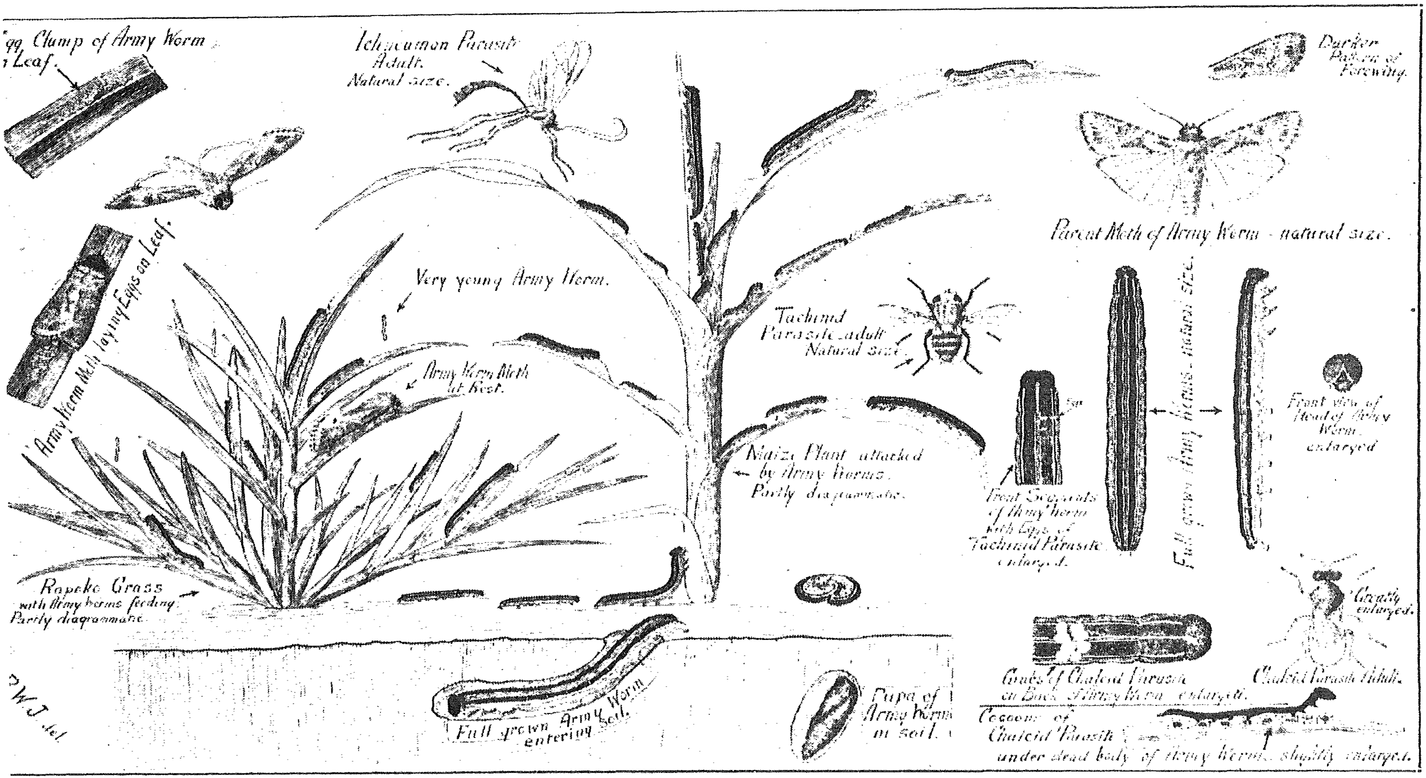
The parent moths of the Army Worm are shown at their natural size in various positions on the plate. They are of night flying habit and are very similar to a number of related species with more or less similar habits. They vary considerably in coloration. The forewings are more or less brown in colour and the hindwings pearly white, with a dark streak round the edge and the course of the "veins" marked with brown. The forewings may, however, be dark enough to present an almost uniform brown appearance or light enough to exhibit a neat pattern as shown in the figures. The front part of the thorax (immediately behind the head) is usually very dark brown, but even this feature does not seem to be altogether constant. To the entomologist the shape and coloration of the *stigmæ*—that is, the two spots shown about half way from the base of the forewing and close to the front margin—afford a definite indication of identity. The sexes are similar in coloration and general appearance.

The Eggs.—These are laid in clumps on the food plant (see plate) and are covered with down from the body of the female, so that the clumps have a felted appearance. The eggs themselves are pearly white, and are shown by the microscope to be ribbed and sculptured in an attractive manner. The clumps are readily visible to the naked eye.

The Caterpillars.—The larvæ or caterpillars measure about 1-16th of an inch when they hatch from the eggs, and attain a length of about $1\frac{3}{4}$ inches when full grown. When very young they have the power of spinning a thread of fine silk on which they can descend from one leaf to another or drop from the plant on disturbance and readily regain their position. This power is lost as the caterpillar grows older. Caterpillars moult their skins a number of times during growth, and these moults are frequently accompanied by noticeable changes in colour. Previous to the last moult, in the case of the present species, there is considerable variation in colour between individuals, but after the last moult the coloration seems to be more uniform. The very young caterpillars are more or less light green in colour. The darker stripes exhibited by the older caterpillars may appear at an early stage in growth, when the caterpillar is half an inch or less in length, but the colour sometimes remains predominantly light green until after the insect is an inch in length. After the last moult the pattern and coloration are in the vast majority as indicated in the figures on the plate. The broad dark stripes along the back are almost black. Between these there are narrow, triple, pale blue stripes, of which the middle one is composed of a series of dots. The broad dark stripes are flanked on the outer side by two narrow pale yellow stripes. These are flanked again by broad zones of very dark brown ground colour, stippled with pale blue, and a further narrow pale yellow stripe intervenes between this zone and the broad nearly black stripes in which the white spiracles or breathing apertures are situated. Beneath this there is a pale yellow zone marked with dark yellow, almost orange. The under parts are apple green, stippled with brown spots showing pale centres. The claspers, or false legs, are green, tinged with pink, and the true legs yellowish green. The head is blackish, with stripes as shown, and the cheeks exhibit some pale markings. The general appearance of the caterpillar is smooth and blackish.

The Pupa.—The pupa or chrysalis is brown and is more or less similar to the same stage in a host of related moths.

Life Cycle.—The number of eggs composing a clump laid by the females is usually in the region of sixty, but



The Army Worm (Laphyma exempta, Wlk.).

as many as ninety have been counted. One female has laid as many as three clumps in the insectary, consisting respectively of 63, 67 and 58 eggs, making a total of 188. These batches were laid on three consecutive days and the female moth then died.

It is to be realised that the moths are markedly restless in confinement and tend to be comparatively short-lived under these conditions. The figures obtained from these cage observations should not, therefore, be regarded as necessarily reliable under natural conditions. The females may be more prolific than the above figures indicate.

The eggs hatch in three to four-and-a-half days. The growth of the caterpillar may be completed in as little as eighteen days, but there is marked variation in the rate of development under cage conditions.

On account of the fact that the growth of the caterpillars in confinement is subnormal, there appears no value in furnishing a graph to illustrate the rate of development. A number of caterpillars were measured daily from birth, but the great majority died at a comparatively early age. The nearest to normal completed its growth and pupated on the eighteenth day. It attained a length of ½ inch by the fourth day and measured a full inch on the ninth. On the thirteenth day it had reached its full length of 1 5-16 inches (32 mm.). So far its development may have approximated to the normal. It failed, however, to make further growth, remaining at this length during the next six days. It then pupated.

Caterpillars about 1 inch in length may, it is judged, be regarded as eight to ten days old, and likely to remain active for about a similar period.

When full grown, the caterpillar makes its way into the soil and there constructs a very fragile thin-walled cell of earth in which it changes to the pupa or chrysalis. It is usual in illustrations for pupal cells in the soil to be given a horizontal position, but the cells observed in cages at Salisbury were mostly nearly vertical. Where large numbers of the caterpillars are concerned the pupal cells are often massed together, and can be removed from the soil in agglomerations which adhere together.

The pupal period lasts about 10 to 12 days.

The first batches of eggs from moths bred in the insectary were secured six days after the moths had emerged from the pupal stage, and the life of the moths in the cages varied from 7 to 16 days. Moths in some instances laid eggs without having had access to any food.

It will be noted from the foregoing that the period dated from the laying of the eggs of one brood to the date of the laying of the eggs of the next may be as short as 38 days.

The number of broods during a single season has not been ascertained with accuracy, due to the fact that efforts to rear several consecutive broods in confinement have so far failed. The caterpillars have shown a high mortality under cage conditions and do not appear to thrive in the way the majority of caterpillars of this family will do under similar circumstances. Also it is not known how the insect passes the dry season.

There is no doubt, however, that there are several generations during the year. Determination of the exact number from direct records in the field would present very great difficulties in view of the possibility of migrations of the moths between the high and low veld. Seeing that a generation on the high veld may be passed in about 40 days in the summer and that moths have emerged freely as late as May, five generations even on the high veld seems a conservative estimate. Green grass is commonly available as early as August in suitable places, but it appears unlikely that the immediate offspring of moths emerging in May could find suitable food and feed up during the high veld winter. It is possible that these late emerging moths either migrate to the warmer low veld, where conditions, except near permanent water, are also dry at this season, or that they live over and lay eggs in the spring. On the other hand, conditions in the "Mist Belt" along the eastern border might favour breeding throughout most of the year.

These points are altogether uncertain at present.

Records of Outbreaks.—Recorded outbreaks of the caterpillars have occurred in various months during the wet season. The first outbreak which came to official notice after establishment of the Entomological Branch occurred at Salisbury from the second week in April, 1910, and was also

recorded in Umtali. These caterpillars yielded large numbers of moths in May.

The next record was the appearance of a large number of the moths in an out-door insect breeding cage at the Agricultural Laboratories, Salisbury, on the 15th April, 1914, the caterpillars having fed on teff grass and potatoes. No outbreak was reported.

In late December, 1914, and January, 1915, outbreaks were reported from the districts of Hartley, Mazoe, Lomagundi and Umtali, and a considerable amount of maize was destroyed. Moths emerged from the second week in January from caterpillars procured in the Hartley district. Towards the end of January, 1915, the caterpillars were prevalent at Salisbury, and moths were bred out from these in the middle of February. A second generation was bred through at Salisbury from moths bred from caterpillars from the Hartley district, eggs being laid about the 15th January. The ensuing moths emerged from the 24th February to the 3rd March, 1915. On 1st February, 1919, Army Worm caterpillars were observed to be abundant on the Polo Ground, Salisbury, but no outbreak on the farms was reported. On the 11th January, 1921, specimens of caterpillars were sent to the office from Que Que, and several farms were found subsequently to be infested in that locality. The pest also appeared at Salisbury, and was particularly bad at Hillside. In early February complaints were received from Enterprise, Umvuma and Gwelo. Later reports referred to damage to maize in parts of Salisbury district, and at Balla Balla, in the Umzingwane district. On the 29th January, 1926, the first report of a severe outbreak at Shamva was received, and in early February outbreaks were reported at Mazoe, Sinoia, Salisbury, Gatooma, Headlands and Rusape. In late December, 1926, and January, 1927, outbreaks occurred in Victoria and Insiza districts. In late December, 1928, and January, 1929, a severe outbreak occurred in the Gatooma district, and the pest was also recorded from Shamva, Bindura, Concession, Sinoia, Salisbury, Insiza, Filabusi, Hunter's Road and Mondoro Reserve.

In January, 1930, occurred the worst outbreak on record, covering practically the whole of the maize growing area of the Colony and including at least the following districts,

namely, Lomagundi, Mazoe, Salisbury, Enterprise, Marandellas, Headlands, Rusape, Inyazura, Umtali, Norton, Hartley, Gatooma, Gwelo and Fort Victoria.

During the past 20 years outbreaks have thus occurred during the following seasons: 1909-10 (too late to do much damage), 1914-15, 1920-21, 1925-26, 1926-27, 1928-29, 1929-30. Of the six destructive outbreaks recorded in 20 years, four have occurred during the past five years. This, however, need not be interpreted as indicating that the insect is becoming definitely more injurious.

Duration of Outbreaks.—The limited duration of outbreaks points to two facts, namely: (1) more or less simultaneous commencement of egg laying on the part of the females, and (2) comparative short duration of the egg laying period. The fragmentary evidence afforded by breeding in the insectary gave a period of three days for the laying of three batches of eggs, but it would be rash to deduce from this that egg laying in the field is confined to quite so short a period.

Outbreaks are not normally noticed until the most forward caterpillars are about 10 days old and over an inch in length. From this point the full weight of the visitation usually lasts about two weeks, although caterpillars may still be met with in some numbers up to nearly a month after the first caterpillars have been noticed.

The later or more backward caterpillars do not seem to thrive with the same vigour as the earlier ones, and a greater percentage are normally destroyed by parasites. The *Chalcid* parasite figured is probably of some significance in this connection, on account of its rapid development and habit of attacking the younger caterpillars.

Food Plants.—The main food plants of this insect are without doubt plants of the grass family. Of cultivated grass crops the chief damage in this Colony has occurred to *maize*, probably due simply to the fact that this is the most extensively cultivated crop. *Teff grass* suffers very severely in the South African Union. *Kaffir corn* and *small cereals* are liable to attack.

The caterpillars appear very capricious in reference to attack on crops other than those of the grass family.

Potatoes are sometimes severely attacked, whilst *peanuts*, *sunflowers* and *beans* according to report are sometimes completely destroyed. In many instances, however, the caterpillars have completely devoured the grassy weeds in a field and left peanuts, sunflowers and beans almost entirely alone. There is no definite record of serious attack on *cotton* or *tobacco*. Certain weeds other than grasses are sometimes fed upon.

Amongst native grasses some species seem to be preferred to others, notably the rapoko grass (*Eleusine indica*) and *Eragrostis potenti-pilosa*. The latter is a fine, feathery grass which commonly takes possession of packed soil, such as roadsides, and is abundant on the polo ground and golf links at Salisbury. Teff grass, *Eragrostis abyssinica*, is no doubt equally attractive.

The caterpillar has also been recorded as attacking another grass, identified as *Rottbœllia exultata*, very freely. Some farmers have also reported large numbers on the red top grass (*Tricholæna rosea*), but this has not been so far observed by officers of the branch. Many other species of grass, including the perennial grasses of the veld, are certainly attacked.

Evidence collected to date suggests that eggs are not laid freely on well grown maize plants, but that they may be laid on young plants and suckers. Most of the cases of severe attack on maize have been traceable either to the land having borne a crop of grass, especially rapoko grass, in addition to the maize, or to invasion from outside; but instances of clean stands of young plants having been attacked have come to light. In many instances attack on the maize has been precipitated by belated cultivation, the caterpillars, previously confined to the grass, leaving this as it withered and attacking the crop. In other cases farmers have reported having saved their crop by refraining from cultivation whilst the caterpillars were active. In these cases the growth of rapoko grass has been very heavy. In the majority of instances, if the weeds have been kept reasonably under control, the grass has not afforded enough sustenance for the caterpillars, and the maize has been attacked as soon as the grass began to give out.

It is to be noted that fallow lands commonly bear a large quantity of rapoko grass in addition to other "sweet" species, and experience shows them to be particularly attractive, many swarms of caterpillars having originated on such land.

Recovery of Maize Plants after Injury.—A very frequent question put to the writer refers to the ability of maize plants to recover after being eaten down by the caterpillars. After the recent outbreak, special attention was paid to this point in various parts of the Colony, and the general conclusion reached was that no maize plants at all seriously injured made anything approaching a full recovery—in fact, no seriously injured crops are known to have turned out profitable. Use of stimulating fertilisers proved ineffective. In many cases the farmers stated that plants, comparatively large at the time of attack, of which only the outer leaves had been eaten, failed to produce cobs. The farmers were of opinion that the feeding of the caterpillars had some poisonous effect on the plant, and this may be the case. Experiments with artificial injury, consisting of severing plants at various heights about ground, indicated that plants would recover if the "heart" were not cut out; but this was not the experience with Army Worm attack in the field. It should be remarked that the nature of the season may possibly influence recovery.

Natural Checks on Increase.—The Army Worm is subject to the attacks of a number of enemies and suffers from several diseases. The most conspicuous enemies are the two storks, namely, the White Stork or Greater Locust Bird (*Ciconia alba*) and the White-bellied Stork (*Abdimia abdimii*). These birds are very beneficial without a doubt, but they seem soon to become surfeited, and disappoint the farmer by standing idly about whilst the caterpillars continue their work on the crop. Also, they do not generally appear until the earlier caterpillars have attained some size and have already done an appreciable amount of harm. Many other birds, including swallows, will eat the caterpillars, but in general there seems to be no great concentration of such feathered allies in the infested fields.

The moths in their nocturnal flights are no doubt destroyed in some numbers by certain species of bats, as well as nightjars.

Certain predaceous insects will also attack the caterpillars, and the females of certain species of wasps provision their nests with them for the benefit of their offspring. Some species of ants also destroy the caterpillars.

Amongst the more efficacious enemies are certain insects which lay eggs on or in the caterpillars, the resultant grubs or maggots being parasitic on or in the caterpillars and so destroying them.

Certain bristly flies of the family *Tachinidæ* tend to parasitise a large percentage of the caterpillars during certain outbreaks. A common *Tachinid* parasite is figured on the plate. This species seems to be *Sturmia atropivora*, also known to parasitise hawk moth caterpillars (fam. *Sphingidæ*). The eggs of this fly are usually laid on the back of the caterpillar, not far behind the head, where the insect cannot get at them with its mandibles (see plate). Eggs, whether by this species or another, are not uncommonly laid on the head. The young maggots eat their way into the caterpillar and feed on its substance, usually avoiding vital parts until the maggots are nearly full grown. When full grown they change to the pupa stage either within the body of the caterpillar or pupa or in the soil near by, the flies appearing later.

The Ichneumon parasite, shown in the plate, appears to be common, but not to compare in destructive ability with the *Tachinid*. The species is thought to be *Henicospilus antancarus*, Mwl. Ichneumons belong to the same order (*Hymenoptera*) as ants, bees and wasps, but they are stingless. The sharp projection at the end of the body of the specimen figured is not a sting but an ovipositor—that is, an organ for the deposition of eggs. The female Ichneumon probably* pierces the skin of the caterpillar with this organ and lays an egg actually in the tissues. Thereafter, the development of the Ichneumon grub or larva follows much the same course as that of the *Tachinid* maggot, but the host caterpillar usually turns into a pupa or chrysalis, and the Ichneumon grub pupates inside this. It is the Ichneumon adult, not the moth, which eventually emerges.

The interesting *Chalcid* parasite figured was first observed by Mr. J. K. Chorley in the Gatooma sub-district

* The breeding habits of this species have not been studied in Southern Rhodesia.

during the recent outbreak, and was found later at Salisbury. The family *Chalcididæ* is also included in the order *Hymenoptera*, and the members may be described as small stingless wasps. The present insect is quite minute, measuring about one-tenth of an inch from its head to the tip of its folded wings. The eggs are laid on the back of the caterpillars towards the head, as in the case of the *Tachinid* flies, but whereas the *Tachinid* generally lays on caterpillars which have attained some considerable size, the *Chalcid* seems to select caterpillars from 10 to 11 millimetres in length—that is, rather less or rather more than ½ inch. The number of eggs laid on a single caterpillar in confinement has varied from 5 to 17, but 5 to 10 is a common number under natural conditions.

This parasite has been bred through at Salisbury in the insectary. The eggs hatch in about six hours. The larvæ (or grubs) attach themselves permanently to the skin of the caterpillar and live as external parasites, sucking the body juices of their host through the skin, something after the habit of a tick (see plate). They are greenish white in colour. They become full grown in about six or seven days. The caterpillar languishes meanwhile, and finally dies. The parasite larvæ then release their hold and make their way under the body of their host, where they arrange themselves eventually in a line between the legs and prolegs (or claspers) of the caterpillar. The exact process has not been observed. Here each spins a loose cocoon, each cocoon being adherent to its neighbours, to the surface of the leaf below and to the body of the caterpillar above. The parasite larvæ then change to the pupal stage, which also lasts about six to seven days, and the adult *Chalcid* "wasps" then appear. The whole cycle thus lasts about a fortnight, and is an example of quick development. The eggs are large, relative to the size of the insect, and have no doubt attained considerable development before being laid, thus allowing of a very short egg stage on the caterpillar. The largest number of eggs laid by a single female *Chalcid* in confinement was 35, and these were laid in three batches (17, 8 and 10) over a period of 10 days. Another female laid 31 eggs in four batches (7, 12, 8 and 4) over a period of 5 days. Other totals vary from 5 to 14. Parthenogenetic reproduction is probable. The females com-

mence to lay within 24 hours of emergence. During a normal outbreak of Army Worm two generations of the *Chalcid* parasite might thus occur. Probably this insect could in time assist appreciably in the reduction of its host to insignificant numbers, and in certain localities it appears to have been an appreciable factor in checking the development of the later caterpillars during the recent outbreak. Unfortunately for the farmer, the parasite is not present in sufficient numbers at the commencement of an outbreak to attack more than an insignificant fraction of the caterpillars immediately, and by the time it has passed through one generation and has increased correspondingly in numbers, the greater part of the damage will have been done. The same remark applies to the *Tachinid* fly and other parasites.

The quickest reducer of Army Worm outbreaks is undoubtedly *disease*, especially that known as *Wilt Disease*. Caterpillars suffering from this complaint become flaccid, discoloured, finally dying and shrivelling up, often leaving their blackened skins adhering to the food plants. This disease spreads particularly in damp, cool weather, and has been observed repeatedly practically to exterminate large swarms. Unfortunately, during the recent outbreak the weather was dry and warm, and disease did not account for any considerable proportion of the caterpillars in any area under observation, nor did it appear in the breeding cages in the insectary.

To the farmer there is an irresistible fascination in the idea of controlling insect pests by means of their natural enemies and diseases. Entomologists are equally interested, and have evolved the term "biological control" to include this particular method of dealing with a pest. It is not necessary in this article to discuss the various aspects of biological control, which has, unfortunately, a vastly more limited application than the layman generally realises. It may be pointed out, however, that the Army Worm is normally controlled by natural agencies, the only unfortunate point being that it sometimes breaks out of control for very brief periods. The controlling agencies are, however, sufficiently powerful to bring it under control again very quickly. It is during this brief period of freedom, so to speak, that the insect accomplishes the damage. At present

it is not possible to accelerate nature's already rapid process of reducing the insect to insignificant numbers. Artificial spreading of "wilt" or other disease amongst insects, although often tried, has never been found effective or at least reliable. Diseases appear to be too closely dependent upon atmospheric conditions to allow of their being spread artificially independently of favourable conditions; and if the conditions are favourable, they usually appear of their own accord.

(To be concluded.)

Seeds for Sale, Gwebi Farm.

		s.	d.
Salisbury White Maize	at per 100lb.	21	0
Salisbury White Maize (Tips and Butts),	at per bag of 200 lbs.	17	0
Kinvarra Oats	at per 100 lbs.	26	0
Ground Nuts (Spanish Bunch in Shell),	at per 75 lbs.	18	3
Majorda Seed	at per lb.	1	1
Sunflower Seed (Large Black)	at per 100 lbs.	16	0
Sunflower Seed (Small Black)	at per 100 lbs.	16	0
Sweet Potato Tubers (Calabash Leaf), available August and September	at per 150 lbs.	11	0
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Napier Fodder Roots	at per bag	6	0
Edible Canna Tubers	at per 100 tubers	9	0

All prices quoted are for *delivery free at any station or siding* in Southern Rhodesia. Before sending cheques, intending purchasers are advised to ascertain that the seeds, etc., required are still available. Cheques should be made payable to "Gwebi Farm." All orders and enquiries should be addressed to the Chief Agriculturist, Department of Agriculture, Salisbury, *not direct to the Gwebi Farm.*

The Feeding of Dairy Stock in Southern Rhodesia.

(Concluded.)

By T. Hamilton, M.A., N.D.A., N.D.D., and J. R. Corry, B.Sc. (Agr.), Dairy Experts.

Economy in Feeding.—The main object of the dairyman is profit, so that due consideration should be paid to cost of feeding. All the roughage required should be grown on the farm, and as far as possible an attempt should be made to supply all necessary concentrates from the same source.

As a rule it is the latter which have to be purchased, and in buying concentrates it should be borne in mind that the market price of any particular feed is no indication of its value to the individual dairyman. The value of any feed to the farmer depends largely on the nature and composition of the other feeds which he has at hand. For example, purchased concentrates such as ground nut cake are not indispensable as cow feed to the dairyman who has an abundance of good leguminous roughage such as cowpea hay. Roughage of this description can be economically supplemented by a mixture of farm-grown grains such as beans, maize and ground nuts. On the other hand, a farmer whose roughage consisted chiefly of low protein feeds such as veld hay, maize stover, etc., would be compelled to purchase concentrates such as ground nut cake to make up for the deficiency of this nutrient.

The aim of the dairyman should be to market a large portion of the crops grown on his farm through his cows, but it should be borne in mind that the kind of crops grown and the way they are fed has a lot to do with their ultimate value when marketed as dairy products, and that as far as

possible the dairyman should avoid sending good crops to market through poor cows.

Frequently it is not the fault of the cow that she fails to give a larger return for the feed she receives. An animal may be fed on large quantities of veld hay, silage and maize meal and yet produce very little milk. A ration consisting of these feeds is not suitable for milk production, and yet it costs money to grow these feeds. The animal does not receive sufficient protein—she is, in fact, under-fed in respect of this nutrient—and her production is limited to the amount of milk that the protein supplied in the ration can produce.

The dairyman, in this case, is supplying the cow with a poor ration at high cost and receiving very little in return.

In many cases an apparently costly feed is relatively cheap. Ground nut cake at £8 per ton would appear to be expensive, and maize meal at 10s. a bag fairly cheap food; yet, regarded as a source of protein, ground nut cake would supply this nutrient at 2d. per lb. and maize meal at about 8d. per lb.

The dairy farmer should bear these facts in mind and remember that it is not enough to supply cows with plenty of feed in quantity without giving some consideration to the kinds and quality of feeds used.

Feeding Roughages.—The dairy cow uses more rough feeds and gives a greater return for them than any other farm animal. Once this fact is appreciated, and the economy of feeding plenty of good roughage realised, the dairyman will find that his whole feeding problems are to a large degree simplified.

It should be the aim of the farmer to supply his cows with an abundance of good, dry roughage and succulent feed; and as far as winter feeding is concerned, the basis of the roughage part of the ration should be a succulent feed and a legume hay. As far as these two classes of roughage are concerned, the Rhodesian dairyman has a choice of several feeds.

As succulent feeds, maize silage, sunflower silage and sweet potatoes or pumpkins can be grown; while legumes

such as the dolichos bean, velvet bean, cowpea and ground nut furnish excellent hay.

Other hay crops can, of course, be grown; in fact, it is advisable to grow a variety of hay crops. Veld hay, cut at the right stage and properly cured, teff hay and Sudan grass hay, oat hay, etc., are all valuable for feeding and have their place in a cow's ration. The one fact that the dairyman should get firmly established in his mind is that for economical feeding the roughage should consist chiefly of a succulent feed and a legume hay. It is desirable, however, that the roughage should have a certain amount of variety, and it is here that hay crops such as teff, oats, etc., serve a very useful purpose.

It is hardly possible to over-estimate the value of a legume hay in the winter ration of a dairy cow. Legumes are cheap sources of protein, the food nutrient so essential for maintenance and milk production; and when it is borne in mind that the majority of the feeds commonly grown on Rhodesian farms are deficient in protein, the importance of a leguminous crop is at once apparent. For example, 30 lbs. of maize silage and 15 lbs. of cowpea hay supply almost as much digestible protein as a ration consisting of 30 lbs. of maize silage, 10 lbs. of veld hay, 3 lbs. of maize meal, 2 lbs. of ground nut cake and 1 lb. of ground dolichos beans. There can be no question as to which is the cheaper of these two rations.

In the feeding of roughages the dairyman should follow a very simple rule: feed all the roughage and succulent feed that the cow will clean up. As a rule a cow will consume about 2 lbs. of dry roughage, or 1 lb. dry roughage and 3 lbs. silage, for every 100 lbs. live weight. A 1,000-lb. cow, therefore, could be reasonably expected to clean up about 30 lbs. of silage and 10 lbs. of hay.

While feeds such as hay, silage, etc., can be fed to the limit of the animal's appetite, the same does not hold good for certain succulent feeds. Pumpkins should not be fed too heavily, and it is wise to limit the quantity of this food supplied daily to about 25 lbs.

Root crops such as sweet potatoes are fed liberally, but the farmer would be well advised in feeding succulents of

this description to regulate the amount fed according to the following rule: The dry matter supplied by root crops should not exceed one-third of the total dry matter contained in the ration, i.e., a cow receiving 30 lbs. of dry matter daily should not receive more than 10 lbs. of this in the form of root crops.

Feeding Concentrates.—A cow of more than average production cannot maintain her milk yield on roughages alone; feeds less bulky and more concentrated in character are required, and the chief purpose for which these concentrated feeds are fed is to supply the extra amount of nutrients required that are not contained in the roughage. In feeding concentrates the dairyman should bear the following facts in mind:—

1. Concentrates are fed according to production, whereas roughage is fed according to the size of the cow. If a cow receives plenty of good roughage she should as a rule receive 1 lb. of grain for every 3 to 4 lbs. of milk produced daily. To feed the correct amount of concentrates, therefore, it is necessary that the farmer should have a fairly good idea as to the milk production of each cow. There is only one way of determining the milk yield of a cow, and that is by means of a scale, and the milk produced by each cow should be weighed occasionally, if not daily, in order that the grain ration may be adjusted.

2. The amount and quantity of concentrates to feed depends very largely on the nature of the roughage available. Roughages of low protein content such as veld hay, maize, silage, etc., must be supplemented by liberal quantities of protein rich feeds. Roughage containing a legume hay, on the other hand, may be supplemented by smaller amounts of less expensive feeds.

3. In feeding concentrates the farmer should endeavour to make use of several feeds. The grain mixture should consist of feeds derived from at least two, and preferably three or four, different sources; ground beans, maize meal and ground ground nuts make quite a good grain mixture. Maize meal, wheat bran and ground nut cake make an excellent concentrate mixture. The grain ration should have as much variety as possible.

4. Attention should be paid to the fact that a concentrate mixture should not consist entirely of heavy feeds, and in mixing grains an attempt should be made to include at least one light feed in the mixture.

An ideal concentrate mixture should weigh about 1 lb. per quart. Wheat bran is a light food and gives bulk to a ration. Corn and cob meal is also a light, bulky feed. If maize and cob meal is not available, use should be made of feeds such as beans, where the pods can be ground along with the seed to furnish a certain amount of bulk and to lighten the ration.

5. The suitability of the feeds used should also be considered. Cotton seed cake is costive and should not be fed to cows shortly before calving. Bean meal is apt to cause purging if fed too liberally.

Compounding Rations.—In compounding rations for his dairy stock the farmer should bear in mind the fact that it is not necessary nor practicable under average Rhodesian conditions to calculate rations separately for each cow in the herd. The average Rhodesian farmer is attempting to dairy with cattle quite unsuited for the purpose, and in order to obtain a reasonable milk or cream cheque many farmers in this country are compelled to milk as many as one hundred or more cows. Where cattle of this kind are concerned it is difficult to suggest any system of feeding that would be economical as well as practicable. As far as possible cows of poor milk-producing capacity should subsist chiefly on grazing in spring and early summer, and be supplied with an abundance of silage and legume hay in autumn and winter. There are many farmers, however, who have dairy herds capable of average and more than average production, and it is with these that the following is concerned.

Assuming that the farmer desires to compound a standard ration for his herd, which consists possibly of quite good milk-producing cows of about 800 lbs. live weight, and yielding two gallons of milk daily, the milk testing 3.5 per cent. butter fat, he should proceed as follows:—

On referring to a previous statement it will be seen that the daily requirements for a cow of this kind are the following:—

800-lb. COW PRODUCING 20 lbs. OF 3.5% MILK DAILY.

	Dry matter.	Digestible protein.	Total digestible nutrients.	Nutritive ratio.
	Lbs.	Lbs.	Lbs.	
For maintenance	16	.56	6.34	
For 20 lbs. 3.5% milk	5	1.10	6.32	
Total	21	1.66	12.66	1 : 6.6

If we assume that the only feeds available are veld hay, maize silage and maize meal, the following rations are suggested. The amount of protein, etc., supplied by the feeds is given in each case. The first ration consists of veld hay and silage fed in quantities that the animal could be reasonably expected to consume, i.e., 10 lbs. of veld hay and 30 lbs. of maize silage. To calculate the amount of dry matter, protein, etc., supplied by such quantities of these feeds, reference should be made to the "Analysis of Feeds" at the end of this article. Veld hay, for instance, contains in 100 lbs.—

Dry matter	91.9 lbs.
Digestible protein	1.2 lbs.
Digestible nutrients	35.9 lbs.

10 lbs. of veld hay would therefore contain—

Dry matter ... ... $\frac{91.9}{10} = 9.19$ lbs.

Digestible protein ... ... $\frac{1.2}{10} = .12$ lbs.

Digestible nutrients ... ... $\frac{35.9}{10} = 3.59$ lbs.

In a similar manner the amount of the various nutrients contained in 30 lbs. of silage can be calculated.

	Dry matter. Lbs.	Digestible protein. Lb.	Digestible nutrients. Lbs.	Nutritive ratio.
Ration No. 1.—				
10 lbs. veld hay	9.19	.12	3.59	
30 lbs. maize silage	7.26	.33	4.50	
	16.45	.45	8.09	1: 17
Ration No. 2.—				
10 lbs. veld hay	9.19	.12	3.59	
30 lbs. maize silage	7.26	.33	4.50	
4 lbs. maize meal ...	3.66	.29	3.47	
	20.11	.74	11.56	1: 14.8

If the amount of protein, etc., contained in these two rations be compared with the amounts of the various nutrients required by the animal in question, it is only too evident that both of these rations are unsuitable and very inadequate for a cow producing two gallons of milk daily.

For the sake of clearness the nutrients contained in these two rations are compared with the requirements of the animal in the following table:—

	Dry matter. Lbs.	Digestible protein. Lbs.	Digestible nutrients. Lbs.	Nutritive ratio.
Requirements of 800-lb. cow producing 20 lbs. 3.5% milk	21	1.66	12.66	1: 6.5
Ration No. 1 ...	16.45	.45	8.09	1: 17
Ration No. 2 ...	20.11	.74	11.56	1: 14.8

Ration No. 1 does not supply sufficient protein for maintenance of the animal, apart from the amount of this nutrient required to produce two gallons of milk. This ration is also deficient in dry matter and digestible nutrients, and is badly balanced, having a nutritive ratio of 1 to 17 instead of 1 to 6 or 1 to 7.

Ration No. 2, on the other hand, supplies sufficient protein for maintenance and leaves a small surplus of .18 lb., which can be used for milk production. This quantity of

protein in this case is sufficient to produce 3 lbs. of milk—roughly, about 2½ pints of milk.

Nos. 1 and 2 are very common winter rations in this country; in fact, many dairymen would regard 4 lbs. of maize meal plus silage and veld hay as a very liberal ration. The inadequacy of the ration, however, is apparent from the above. A cow of this kind fed for any length of time on this ration could not possibly continue to give two gallons of milk, and eventually her production would drop to the quantity in proportion to the amount of protein available for milk-producing purposes.

It is true, of course, that some cows, in which the natural impulse to produce milk is very strong, would continue to yield two gallons of milk on this ration for some time; but such production would be at the expense of the animal's own tissues, and the cow would rapidly lose flesh, and in time the milk flow would cease.

Another unsuitable ration, and one frequently fed, is the following:—

	Dry matter Lbs.	Digestible protein. Lb.	Digestible nutrients. Lbs.	Nutritive ratio.
20 lbs. pumpkins ...	1.80	.18	1.48	
10 lbs. veld hay ...	9.19	.12	3.59	
1 lb. ground nuts ...	.94	.21	1.06	
1 lb. cotton seed ...	.90	.145	.89	
2 lbs. maize meal ...	1.83	.146	1.73	
	14.66	.801	8.75	1 : 9.9

This ration is deficient in protein, digestible nutrients and dry matter. It is badly balanced, having a nutritive ratio of about 1 to 10, and the concentrates carry more fat that can be readily digested by the average dairy cow. Ground nuts and cotton seed contain a very high percentage of oil or fat.

Having discussed a few typically unsuitable rations, it now remains to discuss a few good rations and to demonstrate the economy of feeding good roughage.

The economy of feeding good roughage such as legume hay is clearly shown by the following, where two rations

are compared. In one ration the dry roughage consists of veld hay, and in the other a legume hay is used:—

Ration "A."—

30 lbs. maize silage.
10 lbs. veld hay.
3 lbs. maize meal.
2 lbs. ground nut cake.
1 lb. dolichos beans (seed and pod).

This ration contains:—

Dry matter	21.82 lbs.
Digestible protein	1.72 lbs.
Digestible nutrients ...	13.11 lbs.
Nutritive ratio	1 to 6.6

Ration "B."—

30 lbs. maize silage.
15 lbs. cowpea hay.

This ration contains:—

Dry matter	20.70 lbs.
Digestible protein	1.68 lbs.
Digestible nutrients ...	12.30 lbs.
Nutritive ratio	1 to 6.3

These two rations, which are more or less suitable for an 800-lb. cow producing two gallons of milk, show a striking difference in cost. The concentrates in Ration "A" would probably cost about 5d., whereas Ration "B" contains no grain at all, and yet supplies practically the same amount of protein, etc. Obviously, therefore, Ration "B" is the more economical of the two. It is not suggested, however, that where leguminous roughage is available no concentrates of any kind should be fed. It will be noted that the roughage given in Ration "B" is rather more than a cow of this kind might possibly consume; 30 lbs. of silage is not an excessive allowance for an 800-lb. cow, but 15 lbs. of hay is a heavy allowance of dry roughage, and if the hay is at all unpalatable it is quite probable that a cow of this size might refuse to consume this quantity of dry feed. It is just as necessary to supplement leguminous roughage as it is to supplement hays such as veld hay, maize stover, etc., for the simple reason that no cow of more than average production can consume roughage of any kind to meet her

requirements for milk production. It is generally conceded, however, that cows of less than average performance can be fed chiefly on roughages, but that a good cow should receive portion of her ration in a concentrated form; and the economy of feeding legumes lies in the fact that where an abundance of leguminous roughage is available for feeding, the concentrates required to balance the ration can consist very largely of cheaper grains, and need not be fed in such liberal quantities as would be required in a ration where a poorer quality of roughage was used.

Simplified Feeding.—It has been clearly shown that the type of ration commonly fed to dairy cows in Rhodesia is unsuitable and in many respects inadequate for milk production. In too many cases no attempt is made to provide suitable and balanced rations for the daily herd, with the result that it is the rule rather than the exception to find that the average Rhodesian dairy cow is over-milked and under-fed for at least five or six months of the year. As far as dairy stock are concerned, it is undoubtedly time that better feeding practices were more generally adopted.

Many enquiries in connection with feeding have been received from farmers who have recently purchased dairy stock under the Government loan scheme, and there appears to be a demand for a simple, practical method of compounding rations for dairy cows.

Rationing systems, however, involving complex calculations would in most cases be regarded as impracticable under Rhodesian conditions. The farmer is advised, therefore, to compound rations for his dairy stock in accordance with the following rules:—

1. Feed all the roughage the animals will clean up at all times. As is stated elsewhere, a cow will consume approximately 2 lbs. of dry roughage or 3 lbs. of silage and 1 lb. of dry roughage for every 100 lbs. live weight.

2. Feed concentrates according to production at the rate of 2 to 3 lbs. for each gallon of milk produced daily, or, alternatively, feed 1 lb. of concentrates daily for every lb. of butter fat produced per week. A cow producing 7 lbs. of butter fat in seven days should receive 7 lbs. of concentrates daily in addition to a liberal allowance of good roughage.

The above rule applies only when roughage of good quality is used.

3. Feed a mixture of concentrates suitable for supplementing the roughage, i.e., adjust the concentrate mixture to suit the available roughage. If the roughage consists chiefly of veld hay, silage and similar feeds, the concentrate mixture should contain about 20 per cent. digestible crude protein.

A combination of roughages, such as maize silage and legume hay, may, on the other hand, be supplemented by a concentrate mixture containing about 14 per cent. digestible protein.

Protein Content of Concentrate Mixtures.—The percentage of digestible crude protein in a mixture of concentrates may be calculated in the following manner:—

A concentrate mixture consists of—

2 parts maize meal.
1 part wheat bran.
1 part ground nut cake.

On referring to the "Analysis of Feeds" it will be seen that maize meal contains 7.3 per cent. digestible protein; wheat bran contains 15 per cent. and ground nut cake 46.8 per cent. digestible protein.

The protein content of each feed, multiplied by the number of parts of that feed, is added together and the result divided by the total number of parts of the feeds used in the mixture, e.g.:—

	Protein content.
2 parts maize meal (2 x 7.3)	14.6
1 part wheat bran (1 x 15.0)	15.0
1 part ground nut cake (1 x 46.8)	46.8
4 parts.	76.4

$$\frac{76.4}{4} = 19.1 \text{ per cent. digestible crude protein.}$$

The above mixture therefore contains 19.1 per cent. digestible protein.

Concentrate Mixtures and Typical Rations.—As a rule the Rhodesian dairy farmer has but a limited selection of foodstuffs available for winter feeding; as far as the roughage is concerned, maize silage, veld hay and, to a lesser extent leguminous crops, are the chief feeds.

In the following, concentrate mixtures suitable for supplementing these and similar roughages are submitted. No claim is made that these mixtures are ideal. The rations given and the concentrate mixtures suggested are compounded largely from feeds usually grown on the farm, and they are recommended as suitable chiefly for cows of average production.

The first series of mixtures presented are suitable for supplementing a mixture of low protein roughages such as maize silage and veld hay or maize silage and maize stover, etc.

It will be noted that where the roughage consists chiefly of the above and similar feeds, a liberal allowance of concentrates is recommended, and the farmer is advised to feed the concentrate mixtures in the first series at the rate of at least 3 lbs. for each gallon of milk produced daily.

The second series of concentrate mixtures are suitable for supplementing a mixture of low and high protein roughages such as maize silage and legume hay, etc.

When fed with roughage of this nature, the allowance of concentrates need not be excessive, and the mixtures suggested should be fed at the rate stated.

1. *Concentrate Mixtures suitable for supplementing roughage of low protein content*, e.g., *veld hay, maize silage, maize stover, red top hay, etc.*—To be fed at the rate of 3 to 4 lbs. for each gallon of milk:—

(1) 3 parts maize meal.
2 parts ground dolichos beans (seed and pod).
2 parts ground nut cake.

(2) 2 parts maize meal.
1 part wheat bran.
1 part ground nut cake.

(3) 2 parts maize and cob meal.
2 parts ground oats.
2 parts ground nut cake.

(4) 2 parts maize and cob meal.
1 part ground dolichos beans.
1 part ground nut cake.

(5) 3 parts maize and cob meal.
2 parts ground sunflower seeds (with hulls).
2 parts ground nut cake.

Typical Rations.—For average cows producing 2 gallons of milk daily:—

(1) 35 lbs. maize silage.
10 lbs. red top hay.
2 lbs. maize and cob meal.
2 lbs. ground oats.
2 lbs. ground nut cake.

(2) 20 lbs. maize silage.
10 lbs. sweet potatoes.
10 lbs. veld hay.
3 lbs. maize meal.
2 lbs. ground dolichos beans (seed and pod).
2 lbs. ground nut cake.

2. *Concentrate Mixtures suitable for supplementing a mixture of low and high protein roughages,* e.g., *maize silage and legume hay, etc.*—To be fed at the rate of 2 to 3 lbs. for each gallon of milk:—

(1) 3 parts maize and cob meal.
2 parts ground dolichos beans.
1 part ground nut cake.

(2) 1 part maize meal.
1 part ground dolichos beans.
1 part ground nuts (with hulls).

(3) 3 parts maize and cob meal.
1 part ground nut cake.

(4) 2 parts maize and cob meal.
2 parts ground dolichos beans.
1 part cotton seed cake.

(5) 3 parts maize and cob meal.
2 parts cotton seed cake.

(6) 2 parts maize meal.
1 part velvet bean seed meal.
1 part ground nuts (with hulls).

(7) 4 parts maize meal.
2 parts wheat bran.
1 part ground nut cake.

(8) 2 parts maize and cob meal.
2 parts velvet bean seed meal.
1 part ground sunflower seeds and heads.
1 part ground nuts (with hulls).

(9) 2 parts maize meal.
2 parts ground nuts (with hulls).
1 part ground sunflower seeds and heads.

Typical Rations.—For average cows producing 3 gallons of milk daily:—

(1) 35 lbs. maize silage.
12 lbs. ground nut hay.
4 lbs. maize meal.
2 lbs. wheat bran.
1 lb. ground nut cake.

(2) 20 lbs. maize silage.
10 lbs. sweet potatoes.
12 lbs. dolichos bean hay.
7 lbs. mixture—
1 maize meal.
1 ground dolichos beans.
1 ground nuts (with hulls).

(3) 35 lbs. maize silage.
6 lbs. cowpea hay.
6 lbs. maize stover.
7 lbs. mixture—
3 parts maize and cob meal.
2 parts ground dolichos beans.
1 part ground nut cake.

Spring and Summer Feeding.—During spring and early summer, when there is usually an abundance of green and succulent grazing, the feeding of dairy stock is very much simplified. Veld grass in a green and succulent condition furnishes a fairly well balanced ration and is practically all that is required for animals of less than average production. The necessity for feeding concentrates, however, to dairy cows on pasture has already been emphasised in an early chapter of this article, where it is shown that it is impossible for heavy milking cows to satisfy their requirements for milk

production from veld grazing alone; extra feed in the form of concentrates is invariably required. An additional reason for feeding concentrates to dairy stock on early spring pastures lies in the fact that the average Rhodesian dairy cow is usually in poor condition at this period of the year. It is the common practice for dairy cows to calve at the end of winter or in early spring, and they frequently do so in poor condition. In order that the animal may regain condition and rapidly attain her maximum yield of milk, it is essential that a certain amount of extra feed be supplied. The farmer should make a practice, therefore, of feeding concentrates to dairy cows on early pasture. As a rule the most critical period of the year for the dairy cow is late summer or early autumn. At this time the grazing is usually inadequate or otherwise unsatisfactory for maintaining a full flow of milk.

The most economical supplement to veld pasture at this time is silage or green maize, and as far as possible the dairy cow should receive a liberal allowance of these or similar feeds. The amount of grain to feed to cows on pasture may vary considerably, but as a general rule 2 lbs. of concentrates for every gallon of milk is a liberal allowance. If a limited amount of concentrates is fed, maize meal is as satisfactory a feed as any other, but when a heavy allowance of grain is required—5 lbs. or more—it is advisable to give a certain amount of feeds rich in protein. The following mixtures of concentrates are suggested as suitable for supplementing veld grazing:—

(1) 1 part maize meal.
1 part wheat bran.

(2) 2 parts maize and cob meal.
1 part cotton seed cake.

(3) 4 parts maize meal.
1 part ground nut cake.

Winter Feeding.—A considerable portion of this article refers directly to the winter feeding of dairy cows, and it is hardly necessary, therefore, to enter into a further discussion on this subject. Successful winter feeding is largely a matter of imitating summer conditions. Every farmer knows that the average dairy cow usually attains her maximum production of milk while on summer pasture, when she

is receiving an abundance of palatable, succulent and well-balanced food. As far as possible, therefore, an attempt should be made to maintain these conditions throughout the year. This is entirely feasible if the subject is properly understood and the necessary provision of various winter feeds made.

Succulent feed in the form of silage and sweet potatoes is usually obtainable; in fact, there are very few farms in Rhodesia on which one of these two feeds could not be grown.

In many cases crops such as wheat, barley, oats, etc., can be grown for winter feed. Where crops of this description can be produced the whole problem of maintaining summer conditions throughout the winter is very much simplified.

Green wheat, oats, barley, etc., whether grazed or cut and fed, furnish excellent feed for dairy stock, and when supplemented with suitable concentrates, provide well-balanced rations. Green crops of this kind should be supplemented by concentrates or a mixture of concentrates similar to those recommended for supplementing veld pastures; in fact, the same concentrate mixtures could safely be used.

If the production of winter crops is impossible, except on a very limited scale, it becomes more difficult to maintain exact summer conditions. Excellent results, however, can be obtained by feeding the succulent feeds previously mentioned, together with hay of good quality and concentrates. The importance of leguminous crops in the winter ration of a dairy cow has been emphasised elsewhere; it is sufficient here to state definitely that for economical winter feeding it is essential that legumes be freely used. In some cases a leguminous crop, together with maize, is made into silage. This is quite good practice, and the mixed silage makes good feed.

When compounding rations reference should always be made to the "Analysis of Feeds" attached to this article. The table of the "Analysis of Feeds" has been reprinted and adapted from the "General Composition and Digestible Nutrients of Farm Foods," as published in the *Rhodesia Agricultural Journal* for February, 1924: "The Feeding of Fattening Cattle, Dairy Cows and Pigs."

ANALYSIS OF FEEDS.

Name of foodstuff.	In 100 lbs. Dry matter.	Digestible crude protein.	Total digestible nutrients.	Nutritive ratio.
	lbs.	lbs.	lbs.	1 :
CARBONACEOUS CONCENTRATES—				
Maize	91.7	7.3	86.8	10.9
Maize and cob meal ...	90.0	4.7	75.3	15.0
Kaffir corn	88.8	7.4	80.8	10.0
Oats	92.3	10.7	75.0	6.0
Barley	88.8	6.9	77.6	10.2
Buckwheat	90.0	8.6	64.9	6.5
Nyouti	91.6	6.7	74.7	10.1
Rapoko	89.4	4.5	70.5	14.6
Maize bran	87.5	4.7	71.0	14.1
CONCENTRATES—MEDIUM PROTEIN CONTENT—				
Velvet bean seed and pod ...	88.7	14.5	75.5	4.2
Cowpea	89.2	20.2	76.7	2.8
Sunflower seed with hull ...	93.5	15.5	94.6	5.1
Linseed	93.3	21.4	97.0	3.5
Ground nut with hull ...	94.0	21.3	106.7	4.0
Cotton seed	90.6	14.5	89.2	5.1
Wheat bran	89.0	15.0	60.0	3.0
CONCENTRATES—HIGH PROTEIN CONTENT—				
Velvet bean seed	91.2	23.9	83.5	2.5
Ground nut kernels ...	95.2	27.3	133.1	3.8
Ground nut cake	92.0	46.8	84.7	0.8
Cotton seed cake	93.2	28.3	72.1	1.5
DRY ROUGHAGE—				
Velvet bean hay	90.7	7.3	45.4	5.2
Dolichos bean hay	91.4	7.5	45.3	5.0
Kudzu vine hay	91.9	5.8	45.4	6.8
Ground nut hay	90.5	7.5	52.3	6.0
Cowpea hay	91.8	9.0	52.3	4.8
Veld hay	91.9	1.2	35.9	29.0
Oat hay	91.8	2.6	50.8	18.5
Teff hay	91.0	3.7	47.9	12.0
Manna hay	91.7	3.1	47.3	14.2
Common red-top hay ...	92.4	2.8	49.3	16.6
Golden Timothy hay ...	91.4	2.6	39.9	14.3
Sudan grass hay	91.8	4.2	51.1	11.1
Maize stover	91.6	1.7	54.0	30.7
FRESH GREEN ROUGHAGE—				
Green lucerne	24.0	3.2	13.3	3.1
Green oats in flower ...	23.2	1.4	13.7	8.8
Green barley in flower ...	31.4	1.5	20.7	12.8
Green Napier fodder ...	38.2	1.6	19.6	11.2
Green sugar cane	26.3	0.8	15.7	18.6
Green maize	17.2	0.7	9.3	12.3
SILAGE AND SUCCULENTS—				
Maize silage	24.2	1.1	15.0	12.6
Maize and sunflower silage ...	17.4	1.2	10.6	7.8
Uba cane silage	26.0	0.8	16.1	19.1
Pumpkin	9.0	0.9	7.4	7.2
Sweet potato	29.6	1.0	24.2	23.2
Majorda melon	5.4	0.3	4.4	13.7

Agricultural Costings on the Gwebi Farm.

By H. G. Mundy, Dip.Agric., Chief Agriculturist.

The publication of the balance sheet and profit and loss account of the Gwebi Farm in the March issue of this Journal, and the subsequent detailed accounts which have been published, have given rise to a considerable amount of interest and useful criticism. Several farmers' associations have taken these accounts as subjects for discussion at their meetings, at which the Accountant of the Department of Agriculture and the writer have been present, and divergent views have been expressed as to the usefulness of the enquiry. The consensus of opinion undoubtedly favours the continuance of the work, but it is obvious that a good deal of misapprehension has existed as to the reasons which influenced the Department to institute a cost accounting system on the farm. The following are some of the criticisms which have been advanced:—

(a) That an unimproved land value of £1 an acre does not represent the true value of the land, since surrounding farms are valued more highly and similarly situated farms could not be purchased at that figure at the present time.

(b) That the costings thus far published are unduly high and present an unfavourable view of farming in Rhodesia, for the undermentioned reasons:—

(1) The Gwebi is in the nature of a "show" farm, and more expense is entailed in the maintenance of outward appearances than would be the case on a farm operated strictly on commercial lines.

(2) Much of the manager's time is devoted to receiving and showing visitors around the farm, as distinct from more proper managerial duties.

(3) Live stock are housed in more pretentious buildings than are necessary.

(4) More European supervision and native labour are employed in keeping the necessary records of the numerous different fields and crops and so forth than would be required on a commercial farm.

(c) That an established farm with a large amount of capital invested in the business, and with reserve capital which can be drawn upon as required, provides no useful guide to new settlers commencing a farming career in the Colony with limited capital.

(d) And finally, that the costings at Gwebi are not applicable to the Colony as a whole or to any particular section of the country.

Many of these objections can be upheld, but if the position is carefully considered it is believed that no good grounds will be found for discontinuing the system of costing which has been begun. Practically nothing is yet known about agricultural costs in the Colony, and few farmers are as yet in a position to keep anything approaching accurate or detailed records of any of their production expenses. What farmer can state in pounds, shillings and pence the cost of green manuring and the value of the increased yields obtained thereby, or who can supply accurate figures of the relative costs and returns from a rotation system in which green manuring is employed, as compared with applications of farm manure?

The primary object of the Gwebi is that of a demonstration farm for the heavier type of soils in Mashonaland. The Department of Agriculture demonstrates there what it considers to be approved methods of live stock and arable land management, while at the same time showing the results which follow such methods and their costs. It is not suggested that, because in the year 1928-29 it cost 7s. a bag to produce maize on the Gwebi, this was the maize production cost throughout the Colony in general or even in the particular district in which the farm is situated. Maize, however, is being grown under a number of different cropping and soil treatment systems, and in three or four years, when these results can be carefully analysed, valuable information as to the relative merits of the different methods will be available. The same is equally true in respect to other operations of the farm connected both with live stock and other crops.

While it is inevitable that the costings will never be entirely comparable with those of farms managed on the lines generally followed in Southern Rhodesia, they will yet make known to the agricultural community and to the Department the costs of various operations under the special conditions which apply, the directions perhaps in which economies and improvements can be effected, the cost and value of the foodstuffs fed to live stock and other materials utilised, the proportional charges represented by European supervision and native labour, and much other useful data.

Let it be emphasised once and for all that Gwebi costings do not purport to constitute an enquiry into agricultural costings in the Colony, or even into the cost of producing any special commodity. They merely disclose the cost of the methods followed—for good or for ill—on this particular demonstration farm. It is often said that the ordinary farmer could not afford to keep his fields as free from weeds as is done at Gwebi. The costings over a few years should disclose whether this extra expense is justified or not. Similarly, it is not yet known to what extent and with what frequency artificial fertilisers can be used economically in maize production. The costs of the different treatments accorded to lands under different systems of cropping and fertilising, compared with the yields thus obtained, will throw valuable light on this subject, and in a few years, from all the facts placed before them, farmers should be able—making due allowance for what they may regard as necessary or unnecessary costs—to judge the worth or otherwise of the methods practised.

Pig Accounts.—The following report presents the pig accounts for the year 1st October, 1928, to 30th September, 1929. The pigs kept comprised pedigree Middle Whites and non-pedigree Large Black sows. Of the former breed, young boars and gilts were raised and sold as breeding stock, but if no demand offered for the young sows they were sold to the bacon factory. The Large Black sows were utilised for producing cross-bred pigs for the factory, and all progeny of this type were disposed of in that manner. The demand for Middle White boars was good, but for the gilts it was erratic.

Separate accounts have been kept for the baconers, for the young pedigree boars and gilts and for the breeding stock.

The cost of maintaining the breeding herd—less value of manure made and less sales of old animals to the factory —and allowing for increases and decreases on valuation at the beginning and end of the year respectively, was £127 4s. 5d. This sum has been allocated proportionately over the piglets bred during the year, and the in-take cost of young boars, gilts and baconers respectively has been arrived at by this means. The progeny bred during the year thus carries the cost of maintenance of the breeding herd.

The principal foodstuffs used were maize—charged for at 7s. 9d. per 200 lbs., plus cost of grinding into meal—and separated milk—charged for at 2d. per gallon.

No profitable outlet for separated milk exists on the farm other than for feeding to calves and pigs, and the total cost of the separated milk used for pigs amounted to £101 2s. 4d. On reference to the account for baconers it will be seen that the year's working resulted in a profit of 11s. 8d. per baconer when separated milk was charged for at 2d. per gallon. If this charge is reduced to 1d. per gallon the profit on each baconer sold is increased by 4s. 11d. and the total profit per baconer to 16s. 7d. A decision as to the correct charge to make for separated milk in this case is somewhat difficult, but it may be pointed out that any difference in price which may be made will be reflected in the dairy herd account, since this is credited with the value of separated milk fed to pigs.

An examination of the pedigree boars and gilts account discloses the fact that a loss of £21 6s. 11d. was made on this section of the pig department. This loss would appear to be due to the uncertain demand for pigs of this class and the fact that they were kept for longer periods than was justified by the price charged for them. The three gilts sold to the bacon factory realised a better figure than the average price realised for the remaining gilts sold as breeding stock.

Note.—The staff of the Gwebi Farm is responsible for the records and allocations on which this report is based, and the office of the Accountant to the Agricultural and Veterinary Departments for the compilation of the tables.

Plumtree's First Show.

By "SCRIBBLER."

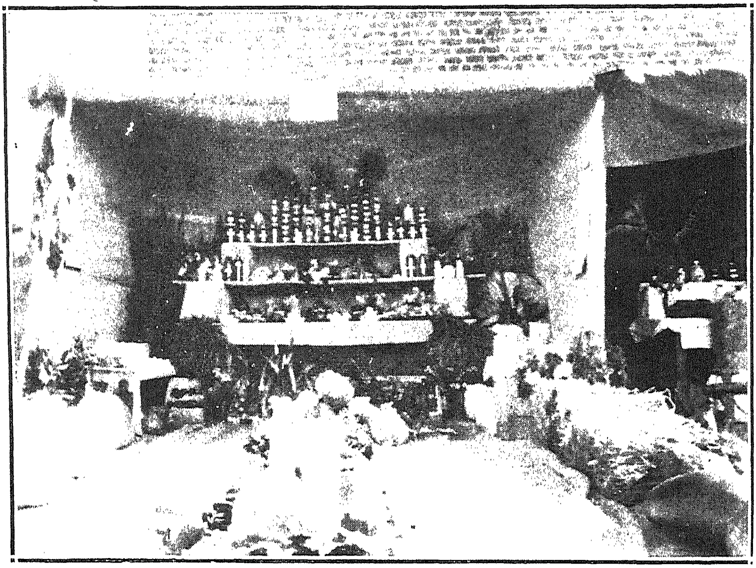
Realising that holding anything in the way of an agricultural exhibition or show on the usual individual lines was doomed to failure, as we are not an agricultural district, but mostly ranching, and the few farmers are living far apart, added to which the season had been a poor one, we decided to try something new.

The area covered by the Western Farmers' Association was divided into five sections. Each section had an organiser and was asked to stage a stall of anything and everything grown or produced on a farm. The only rules laid down were that bread, cakes, etc., must be made from locally grown wheat or grain; paintings and needlework were debarred and a maximum of three bottles of any variety of jam, etc., and 10 lbs. of grains was laid down. The actual cash expenditure on decorating the stalls was to be limited to £1.

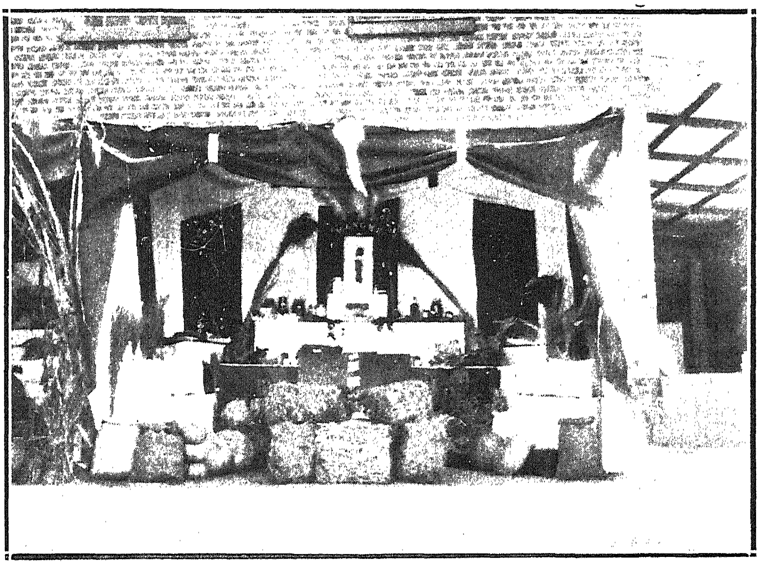
The "day" was favoured by glorious weather, and the result certainly exceeded our wildest hopes. There was no question that everyone was surprised, but the most surprised were the stallholders themselves. Having eliminated the individual effort completely and gained the "team" spirit so much desired, it would be against that idea to mention individuals or stalls.

There were beetroots and bacon, cabbages and cotton, sausages and sweet potatoes, oranges and onions, meat rolls and milk, dressed fowls and ducks, maize and monkey nuts, cream and chutney, cheese and chillies—in fact, a wonderful assortment.

The judges, Messrs. Mainwaring of the Matopos and N. A. Wilson of Sandown, were pleased with the results and commented favourably on both quality and variety.



The Tegwani Stall. Winners, Plumtree Show.



The Mangwe Stall. Second at Plumtree Show.

There was no question that both quality and variety were evident, and in some of the items, such as majordas and pumpkins, could not be improved on.

Practically the whole district was present, as well as visitors from Tati, Marula, Figtree, Bulawayo and Matopos. Amongst the officials were the Hon. the Minister of Agriculture and Lands, who opened the show, and Mrs. Fletcher, who presented the cup to the winning stall; Dr. and Mrs. Haylett and Mr. and Mrs. Mainwaring from the Matopos, Dr. Romyn from Salisbury and Mr. Corry from Bulawayo.

The judges and officials were entertained to lunch at the hotel, and in the evening a dance in the War Memorial Hall, with an orchestra from Bulawayo, brought to an end a day which will long be remembered in Plumtree.

Notes from the Veterinary Laboratory.

SOME NOTES ON VIRUS DISEASES.

By Ll. E. W. Bevan, M.R.C.V.S., Director of Veterinary Research, Southern Rhodesia.

Presented to a Meeting of the Professional and Technical Officers of the Department of Agriculture, 5th August, 1930.

Since the earliest times infectious diseases have been recognised and attempts made to overcome them; but the actual cause of many of them remained a mystery. They were attributed to many things—to divine wrath, to evil spirits, to the influence of the stars, the weather, to miasmas, humours and even to spontaneous generation. The advent of the microscope during the early part of the last century introduced new methods of studying them, but it remained for the great Pasteur to bring his genius to bear upon the problem and to demonstrate the microbial origin of disease.

In so short a time these age-old mysteries yielded to the imagination and methods of that great scientist that he would almost appear to have been inspired. The orderly sequence of his work and discoveries was truly remarkable. Commencing as a chemist, he became interested in crystallography, especially in connection with racemic and tartaric acid crystals found in the wine vats. This brought him to the study of fermentations, and he demonstrated that the conversion of sugar into alcohol by fermentation was the result of a vital process of yeast. He found that the conversion of sugar into lactic acid was also due to microscopic organisms. From this he surmised that putrefaction and even disease might be caused by similar bodies. He wrote, "what would be most desirable would be to push those studies far enough to prepare the road for a serious research into the origin of various disease."(1) With this idea in his mind, he investigated two diseases of silk worms which were ruining the silk industry in France at the time, and these he proved to be due to "germs." Later he investigated other diseases of animals, such as anthrax, chicken cholera and swine erysipelas, which again he proved to be due to microscopic organisms capable of cultivation in appropriate media outside the animal body. He found also that by various methods the virulence of such organisms could be attenuated to such a degree that when inoculated into a susceptible animal they failed to infect it, but gave rise to immunity or resistance to subsequent infection with virulent organisms. In this way he introduced the principle of preventive inoculation against bacterial diseases, and applying his process further he evolved a method of treatment against rabies.

But in the case of rabies, Pasteur was dealing with something different; for although he could prevent the disease by inoculation, he could not determine the cause of it. The cause of it was there: the brain and spinal cord, the saliva of the infected animal contained it, but it could not be demonstrated by the microscope, by cultivation or by any of the methods he was accustomed to employ. Hitherto Pasteur had worked with the infinitely small, but here was a disease due to something infinitely smaller. Rabies, in fact, was a disease which belonged to another category. It was a virus disease. He was thus confronted with "new

realms to conquer," but, unfortunately, he did not live to conquer them.

Since then an army of workers has laboured unceasingly at the study of what are known as the virus diseases; innumerable experiments have been carried out, and a veritable mountain of literature has been published concerning them. Many diseases have been added to this list; some new, like psittacosis, others old, as the "common cold"; every day the number increases. It would be impossible to give anything like a complete list of them, but the following are a few important examples of the diseases of man, animals, plants and insects which are attributed to them:—

* VIRUS DISEASES.(2)

Of Man.—

Small-pox, Varioloid, Alastrim.
Chicken-pox.
Herpes zoster.
Encephalitis lethargica.
Poliomoyelitis.
Measles. German measles.
Influenza.
Common cold.
Dengue fever.
Yellow fever.
Typhus fever.
Trench fever.
Rocky mountain fever.
Rabies.

Of Animals.—

Rinderpest.
Swine fever.
Pernicious anæmia of horses.
Foot and mouth disease.
Distemper of dogs.
Fowl-pox.
Rous sarcoma of chickens.
Epithelimoma of fish.
Blue tongue of sheep.
African horse-sickness.

* Selected from "Filterable Viruses," by Thos. M. Rivers and others.

Of Plants.—

Mosaic Diseases of—

Corn, sugar cane, millet, rice, banana, hops, buckwheat, spinach, beetroot, turnip, mustard, white and red clover, alfalfa, peanut, celery, sweet potato, tomato, tobacco, potato, water melon, cucumber, lettuce; sweet william, sweet pea, petunia, lobelia, marigold, aster.

Other than Mosaic Diseases—

Yellows of peach.
Yellows of strawberry.
Rosette of wheat.
Rosette of peach.
Witches' broom of potato.
Bunchy top of bananas.
Spotted wilt of tomatoes.

Of Insects.—

Sacbrood of honey bees.
Wilt of the gipsy-moth caterpillar
Jaundice of silk worms.

Polyhedral Disease of—

Saturnidæ—buck moth.
Arctiidœ—virgin tiger moth.
Leucania unipuncta—army worm.
Autographa braccica—cabbage worm.
Bombyx mori—silk worm.
Pontia rapæ—cabbage worm.

Of Bacteria.—

Just as lesser fleas have smaller fleas to bite them, so even the microbes themselves are said to suffer from virus diseases, and the so-called bacteriophagy is attributed to them.

But notwithstanding the formidable collection of diseases which have been attributed to virus disease, the nature of a virus is not understood even to-day.

What is a virus? By the term virus is understood an infective agent so small that it cannot be viewed under the highest power of the microscope. It may also be so small that it will pass through the pores of an unglazed porcelain or other filter. For these reasons the names ultra-visible or

ultra-microscopic viruses, filter passers, filtrable viruses have been applied to them. But there are objections to each of these designations. For example, the term ultra-microscopic is misleading. According to Abbé, organisms which are less than 0.1 micron in diameter must remain invisible. Barnard,(3) however, using ultra-violet light and wave-lengths of about 250 million parts of a millimetre, claims to have photographed particulars down to a size of 0.08 micron. Some organisms cannot be viewed individually, but can be demonstrated in colonies, as, for example, the causal organism in pleuro-pneumonia. After successful culture in the peritoneal cavity of rabbits, masses of these minute organisms become visible. For that reason M'Fadyean suggested that they should be removed from the group under discussion. The fact that a body is ultra-microscopic may only mean that technique is at fault.

Similarly, the terms based upon the ability of the infective agent to pass through various types of filter are open to objection. These filters do not act towards microbes as does a sieve used to sift seeds. Dacloux has pointed out that "even the bacteria of average size, such as the vibrio of cholera, are smaller than the pores of our filters, and their size would permit them to pass through, as a train passes through a tunnel, without rubbing against the walls; what keeps them back is that they are held against the walls by capillary pressure." (Burnet.)(4) Filtration is not a simple mechanical operation. It is influenced by many factors—the quantity of the virus, its viscosity, the rigidity or dislocation and mobility of the particles in it, their surface tension, the electrical charge on the virus or on the filter, the amount of protein or other substance in the virus mixture, temperature, pressure, time, the structure of the filters. Some bacteria will actually grow through the entire thickness of an efficient filter. The arrest, therefore, of even smaller particles is probably a molecular attraction between the passing bodies and the solid substances bounding the space through which they have to pass. Organisms which are motile appear to pass more readily through a filter than those not endowed with the power of movement. There are, therefore, innumerable pitfalls in the interpretation of the process of filtration.

If, therefore, the cause of a disease is invisible under the most powerful microscope, is so small that it will pass through a porcelain or other filter, which will hold back the smallest known bacterium, what evidence is necessary to prove that a disease is caused by a virus? Probably the only possible proof of the presence of a virus is its power of multiplication and the effect it produces. There exists a distinct similarity in the course of virus diseases and those known to be caused by bacteria or other visible living organisms—namely, an incubation period between the introduction of the virus and the manifestation of its effect, its multiplication in the susceptible animal, its adaptability to environment without loss of identity, its assimilation of surrounding medium and its power of setting up a state of immunity.

These points are emphasised because there are two schools of opinion concerning the viruses. Some regard them as living entities comparable, as stated, to the bacteria; but others hold that they are not living, and suggest that they are of the nature of an enzyme or catalyst and "that the increase of the virus is due to the living properties of the host, which, as the result of stimulation by a small amount of virus, reacts by producing fresh virus in large quantities, owing to an unwonted or pathological metabolic activity."(5) Or to express it in another way, that they may be looked upon "as something unorganised, enzyme-like in nature, possibly the result of some deranged function of tissue cells, which, once having been generated, would be capable of again setting in train those changes which in the first instance produced them."(6)

Some of these viruses are of a septicæmic type—that is to say, the blood is the main seat of multiplication, e.g., horse-sickness. Others exert their influence locally upon certain tissues, as, for example, small-pox, vaccinia, foot and mouth disease. Some produce remarkable changes in certain cells. In some they bring about a process known as "ballooning degeneration," resulting in the degeneration and death of the cell. In other diseases they appear to stimulate the growth and proliferation of infected cells. In some diseases the lesions caused within the cell are almost characteristic. Some microscopic changes are called "inclusion bodies" and are of diagnostic value. Some regard these

bodies as the virus itself, others consider them to be the products of the degeneration of the cells, and others again regard them as the virus surrounded by cellular material. Their actual nature is not entirely understood.

Some viruses are extremely contagious, e.g., small-pox; others are not spread by contact, but are inoculable, e.g., rabies; others again are insect-borne. The virus diseases of plants are, I believe, chiefly transmitted by grafting or pruning; but some *are* insect-borne, as, for example, crinkle or leaf drop of potatoes, which are infected by an aphis, *Myzus persicæ*.(7) Generally speaking, viruses appear to have little in common clinically or epidemiologically.

Until recently it was held that viruses differed from bacteria in that they could not be cultivated apart from the animal body, but several of them have now been successfully grown in the presence of living cells in tissue cultures. For example, Harde claims to have grown vaccine virus *in vitro* in the presence of living corneal cells. If the corneal cells are killed by freezing, no growth is obtained.

"No lifeless culture medium has as yet been discovered which provides a virus with the substances required for its maintenance and growth." (Carrel.)(8) Vaccine virus has been grown by Rivers and Carrel in pulp made of skin, cornea or brain of chick embryos suspended in tyrode solution containing the virus. The embryonic pulp which originally inoculated with 25 or 250 units per c.c. contains eventually 100,000 units per c.c. after eight days' cultivation. Carrel claims that "it is probable that a chick embryo crushed to a fine pulp is capable of producing as much vaccine as a calf." Hitherto the only method of studying virus diseases has been by the infection of living animals susceptible to them. Their cultivation outside the living body will greatly simplify the study of them, and may lead to the solution of the many problems associated with them.

The study of immunity against virus diseases is of considerable interest and importance. It may be said to have commenced with the researches of Jenner, who, in 1796, was able to put the practical experience of the Gloucestershire dairy folk that recovery from cow-pox protected against small-pox to scientific proof.

Many of the viruses are infective only for one species of animal, e.g., swine fever for pigs; others are infective to a number of species, e.g., rabies, which affects man and animals of various species; none of them appears to be infective to all species. Resistance against them may be natural or acquired, active or passive. Thus man is *naturally* resistant to, say, horse-sickness; may *acquire* active immunity against measles as the result of recovery from that disease, or against small-pox as the result of vaccination. Or, to take another example, equines possess a natural resistance to rinderpest, which is a disease of ruminants; cattle can be rendered *actively* immune against it by simultaneous inoculation of virus and the serum of a recovered animal, or can be given a *passive* immunity by inoculating them with the recovered serum without the virus. Such serum has been found to contain virucidal properties, complement-fixating bodies and, it is claimed, agglutinins, which are not present in the blood of naturally resistant animals.

As a rule, immunity resulting from recovery from a virus disease is of long duration, but how such immunity is maintained is not known. It is thought that certain cells cease to be susceptible to the harmful influence of the specific virus, but their invulnerability must be inherited by their daughter cells. Others attribute this lasting immunity to persistence of infection. There are diseases where infection does remain for a considerable time, as, for example, pernicious anæmia of horses and foot and mouth disease; but there are certainly others in which it does not, as, for example, measles.

Certain "potato plants," although outwardly perfectly normal and healthy, yet carry in their sap one or more potato viruses—that is to say, the virus exists in a quiescent yet infective condition within the "carrier" plant, which exhibits no disease symptoms. "If a scion from such a plant be grafted on a healthy plant of another and susceptible variety, the disease develops in the latter, although the scion continues to show no symptoms."(9)

Similarly, a common weed, black nightshade (*Solanum nigrum*), has been found to carry certain of these virus diseases of potatoes, although itself unharmed by them.

Just as there are various strains of virus, as in foot and mouth disease and African horse-sickness, so immunity

against one strain does not necessarily hold good against another. Each virus, therefore, must be attacked as a separate entity.

There are various methods of setting up immunity against virus diseases, but it appears that lasting immunity can only be acquired as the result of recovery from infection. The inoculation of human subjects from cow-pox to protect them against small-pox has been referred to. At the present time inoculation with viruses modified or attenuated by admixture with chemical substances is in vogue. For example, the canine-anti-distemper vaccine is prepared by treating a spleen emulsion from an infected dog or ferret with phenol or formaldehyde. Heat can also be used; 55 degrees C. for 1 hour or 60 degrees C. for 30 minutes will inactivate the virus. The procedure in practice is to give first a dose of vaccine, and after a week or 10 days a dose of living virus, the reaction to which is thus modified or controlled. The formaldehyde method is also now employed in preparing a rinderpest vaccine, and experiments are in hand with a view to obtaining a horse-sickness vaccine in a similar manner. Carbol-glycerine is used instead of formaldehyde in the preparation of vaccines to protect against fowl plague and rabies. How these agents act and whether the constituents of these vaccines are dead or alive, or partly dead and partly alive, is not precisely known. It is probable that there are some living elements in them which, although incapable of producing symptoms, can still propagate in the tissues of the host for a certain time, and thus bring about immunity against a natural or artificial infection with a full strength virus.

The serum of a recovered animal is sometimes made use of to control the action of virus. Thus in rinderpest and horse-sickness the simultaneous virus-serum method of inoculation is employed, the reaction of a small quantity of virus being restrained by a large quantity of immune serum. An animal rendered immune in this way can be hyperimmunised by repeated injections of virulent material, the protective properties of its serum becoming enhanced thereby.

The manner in which the serum acts upon the virus is a matter for speculation. It does not appear to be a chemical interaction, but rather a loose binding between virus and

serum, which can be again separated. Todd found in the case of fowl plague that a virus-immune serum mixture was non-infective if injected into the muscles, but was infective if diluted. Andrewes demonstrated in the case of vaccinia that a virus-serum mixture introduced intra-dermically produced no lesion. If serum was first injected and virus later, no lesion was produced, but if virus was injected five minutes before the serum, a local lesion occurred. In the case of herpes, if virus and serum were introduced immediately after mixing, lesions occurred, but no lesions were met with if they had been in contact for four hours.[10]

In tissue culture similar phenomena are met with. If virus is introduced into a medium consisting of normal tissue bathed in normal plasma or serum, inclusion bodies are found in the tissues which are infective, indicating the activity of the virus in them. If immune tissue is bathed in immune serum, virus does not propagate and no inclusion bodies are found in the tissue. If immune tissue is bathed in normal serum, inclusion bodies are formed in the tissues which, if washed free from serum, are infective. The study of these phenomena *in vitro* will greatly simplify the investigation of the problems associated with the virus diseases, which hitherto could only be studied by infecting susceptible animals.

It would be impossible for me in the time at my disposal to deal with the numerous diseases enumerated in the list given at the beginning of this paper, and I propose, therefore, to leave the virus diseases of man, plants and insects to those who specialise in them, and who, I hope, will take part in the discussion later. I will content myself by giving you a few particulars concerning African horse-sickness, a disease in which I have been interested for the past 25 years and one which will serve to exemplify some of the points emphasised in my paper.

African horse-sickness is a disease of horses, mules and donkeys. The latter are highly resistant to natural and artificial infection, but I have seen donkeys which have died from the disease naturally acquired, and I have killed horses by inoculating them with their blood. Dogs are also susceptible by inoculation, and, as I demonstrated in 1911, may contract the disease by feeding on the meat of a mule

dead of the disease. Young Angora goats have been infected artificially, and their blood proved infective to dogs, but, strangely enough, the blood of the reacting dogs did not prove infective to horses.

In natural conditions, however, horses and mules are the chief victims of this disease, and in the pre-inoculation days in this Colony the mortality among them was enormous. It is estimated that in some years over 75 per cent. of the equine population of the Colony was destroyed by it. It was not until 1905 that Theiler's method of inoculation was successfully applied for the protection of mules, and in 1915 my own method of inoculation was introduced for the protection of horses and later for mules.

The virus of horse-sickness is extremely small, it will pass through the finest-grained filters; it resists considerable heat—up to 50 degrees C.—but is destroyed by desiccation. It will remain infective for many years when preserved in a solution of glycerine, phenol and water—in my own experience as long as 14 years. It is remarkably resistant to putrefaction. It is closely associated with the red blood cells, from which it cannot be separated by washing. The minutest trace of it (even as small a quantity as 0.001 c.c. of a highly virulent virus) will cause the disease if inoculated under the skin or into the vein of a susceptible animal. But 100 to 200 c.c. are necessary to infect if given by the mouth. After inoculation there is a period of incubation, when no changes in the animal are noticeable. This varies from four to eight days, according to the strength of the virus. The first indication of infection is an elevation of temperature, which continues to rise for several days before the symptoms of the disease are manifested. It is frequently only at the termination of the disease that these become appreciable, and often an animal appears to die quite suddenly. But from the time of the first elevation of temperature the whole body is permeated by the virus—the animal becomes a veritable skinful of it. A single drop of its blood, taken during the febrile stage, is capable of setting up the disease if transferred to another susceptible animal. In the words quoted before, the virus has multiplied in and assimilated the tissues of the animal, and has not lost its identity in the process.

It is not known how in nature the virus is transmitted from the sick to the healthy animal. Horse-sickness is not a contagious disease, but it is readily inoculable.

How, then, is the disease transmitted? It has been shown experimentally that if night-flying insects are excluded from stables by suitable mosquito netting, the animals in the stables are protected from infection. Various species of mosquito were tested as to their ability to transmit infection, but none of them could be definitely incriminated. Practical experience in this Colony throws suspicion upon the midge, but its guilt has not been put to scientific proof. If a horse is exposed to infection in a place where horses are not present, and have not been present for a considerable time, it may contract horse-sickness. From whence is the virus derived? The reservoir is not known. Theiler(12) tested the blood of innumerable species of birds, the jackal, hedgehog, rock rabbit, bats, striped mice, grey mice, field bats, zebra and yellow meercat; 67 injections in all were made without causing infection. Also the blood of reptiles, iguana, water tortoise; 8 injections in all yielded negative results. He also tested the blood of domesticated ruminants, cattle, Africander goats and lambs, dogs and salted horses and the blood of four natives with negative results. I myself noted that the first case of horse-sickness in Salisbury on each of two years was in horses stabled where sheep were kept in close proximity to the stable. R. I. M. Kelly and I, in one of these instances, took 10 c.c. of blood from each of 23 sheep, and having mixed it inoculated a horse with it, but no horse-sickness resulted. I have also tested the blood of bullfrogs, which I had reason to suspect might be reservoirs of infection, without success.

Under natural conditions a few animals recover; they are said to be "salted." But such animals are susceptible to relapses or re-infections. As I have said before, a horse which is "salted" in one district may become infected in another. For example, a very old horse which had lived for many years at Glen Lorne Farm died from horse-sickness the first season after its removal to Rhodesville, not seven miles away. I could quote numerous other examples, and the proof of the contention that immunity against one virus may not protect against infection with another has been abundantly

demonstrated by laboratory methods. It is also indicated by the charts presented, which show the behaviour of my inoculated police horses when distributed throughout the country and exposed to infection with the viruses of the various districts. Fortunately, in the case of inoculated horses, the immunity conveyed by the strain of virus used protects against most of the natural strains in the Colony.

With regard to the various methods of setting up immunity by artificial inoculation, the method of Theiler previously referred to proved extremely successful in protecting mules, but was less satisfactory with horses. It consisted of the introduction of a small quantity of virus and at the same time a large quantity of hyper-immune serum to control it. The collection of such large quantities of serum was a costly business, and was associated with certain difficulties, such as the fact that the serum of some animals proved hæmolytic (capable of causing dissolution of the blood) when introduced into other animals. Also, a second virus, pernicious anæmia, made its way into the true horse-sickness viruses and gave rise to very undesirable complications. For some years past this method has been superseded in this Colony, both for horses and mules, by my own method.

I have to admit that from the scientific point of view my method is most unsatisfactory. The nature of the virus, the manner in which it acts, the reason why one virus differs from another, the explanation of why the vaccine produces a reaction from which the horse recovers, although at a certain time during the reaction every particle of its blood is capable of killing another horse, not being known, the method is undoubtedly quite empirical. But for similar reasons other methods are equally so. Indeed, all methods of conveying protection against virus diseases are open to the same objection. It has, however, served its purpose, and the work in connection with it has not cost the Government a penny; indeed, a profit has been derived from the disposal of experimental animals enhanced in value by the inoculation; the sale of vaccine to the public, which has brought in many hundreds of pounds to revenue; to say nothing of the fact that the B.S.A. Police have been converted into a mounted force, the yearly mortality among their

horses having been reduced from 50 to 75 per cent. per annum to less than 3 per cent. According to figures collected by the Police, the total mortality of all equines in the country in the year 1929 from all causes was 12.2 per cent., and among the inoculated horses and mules only 2.69 per cent. But after all the toil and tribulations suffered in elaborating this process, it is no longer required. There are no horses to inoculate.

I have delayed so long in the discussion of horse-sickness that I can only briefly refer to one or two other virus diseases of animals which have been successfully controlled by the veterinary profession. For example, rinderpest, which in 1896 swept through this Colony, destroying 95 per cent. of all our cattle on its way south. I cannot attempt to discuss the virus which causes this disease, the symptoms or the many interesting features associated with it. I will only refer to the fact that in 1897 Koch reported to the Secretary of Agriculture of Cape Colony "that blood serum of cattle which have recovered from rinderpest has a certain immunising effect upon healthy stock when inoculated with it." Bordet, Theiler, Kolle and Turner elaborated Koch's idea and placed the simultaneous virus-serum method of conveying immunity upon a sound basis. In September, 1898, the last case of rinderpest occurred in this Colony, which since then has been entirely free from it.(13)

Another success which I feel I must refer to, and which stands to the credit of the veterinary profession in this Colony, is the eradication of rabies, which was dealt with in another manner. This virus disease appeared near Bulawayo in August, 1902. By 22nd November of that year 9,483 dogs, of which 32 were visibly affected with the disease, had been destroyed and fourteen persons had been bitten. "By the end of March, 1903, the number of stray dogs destroyed was 29,500 in Matabeleland and 8,759 in Mashonaland. Up to the end of March, 1904, the number of dogs put to death for non-compliance with the muzzling regulations totalled 60,000." In 1909 muzzling was abandoned and regulations promulgated which provided that all dogs within a suspected infected area should be kept within a safe enclosure or be chained up for a period of not less than six weeks. This procedure proved most satisfactory, but occa-

sional cases occurred until August, 1913, since when no further cases have been met with in Southern Rhodesia.[14] When the enormous number of native dogs, of jackals and other wild animals susceptible to rabies is remembered, the eradication of this awful disease in a virgin country in so short a period as eleven years is, when compared with the history of other countries, a notable achievement.

Blue tongue or catarrhal fever of sheep is another virus disease which the veterinary profession has dealt with successfully by means of an attenuated virus vaccine, without which the sheep industry in South Africa would not have developed to its present state of economic importance.[15]

Thus the practical efforts of my profession against virus diseases have resulted in considerable success and enormous profit to the pastoralist in this Colony and other parts of the world. They may be regarded as an example of the virtue of vision, faith and courage in research. They may appear to the superscientist as unorthodox, but to the practical man they have proved of enormous benefit and a very ready help in time of trouble.

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Maize and Meteorology.

By N. P. Sellick, M.C., B.Sc.

The importance of weather variations and climate in the production of crops can hardly be over-estimated. Soil, labour and markets affect the economic aspect of production, but the climate in the long run determines the success or failure of the crop. The details of climate or weather play a very large part in the variability of yield of a crop from year to year.

Many investigations have been carried out to determine the relation of crop yield to weather. In the United States of America, in particular, the relation between maize yield and weather has been studied. Kincer and Mattice ("Monthly Weather Review," February, 1928) show that the variation of the maize yield during a period of 25 years is very closely related to the variation of various weather factors. The relationship is represented by the correlation factor 0.93, which indicates that variations of weather account for at least 60 per cent. of the variations in yield.

Professor W. B. Schostakowitsch, of Leningrad, who is making a general study of the subject, recently requested this office to supply crop yield statistics and meteorological data for this purpose. The former data were kindly supplied by the Statistical Bureau and a preliminary analysis was undertaken in this office. The results were sufficiently encouraging to warrant a fuller investigation, which the writer sets out in this paper.

The crop yield data available are:—

(1) The yield in bags of grain per acre arranged in native districts for a period of 16 years.

(2) The yield in bags of grain per acre on various plots at the Agricultural Experiment Station, Salisbury, for a somewhat shorter period.

The yields in Mazoe and at the Experiment Station were selected for investigation.

Figure 1 shows the maize yield in Mazoe for the period 1913-14 to 1928-29 in bags per acre. The horizontal line represents the mean yield during the period and the sloping line represents the general trend of yield during the period. The slope of this line indicates that there is a slight tendency for the maize yields to diminish in the later years. If the yield were constant the line would lie along the horizontal average line, and if the yield were increasing it would slope upwards from left to right.

Many independent factors are involved in the determination of the slope of the line. It will be shown later that, as far as these investigations have been carried, the "weather line" has no appreciable slope and has, therefore, not contributed to the fall off.

Figure 2 shows curves calculated in the same way for the first set of rotation experiments carried out at the Agricultural Experiment Station, Salisbury. The relevant figures are published annually in the Journal. Four sets of curves are shown.

I. represents maize, continuous.

II. represents alternate maize and bare fallow.

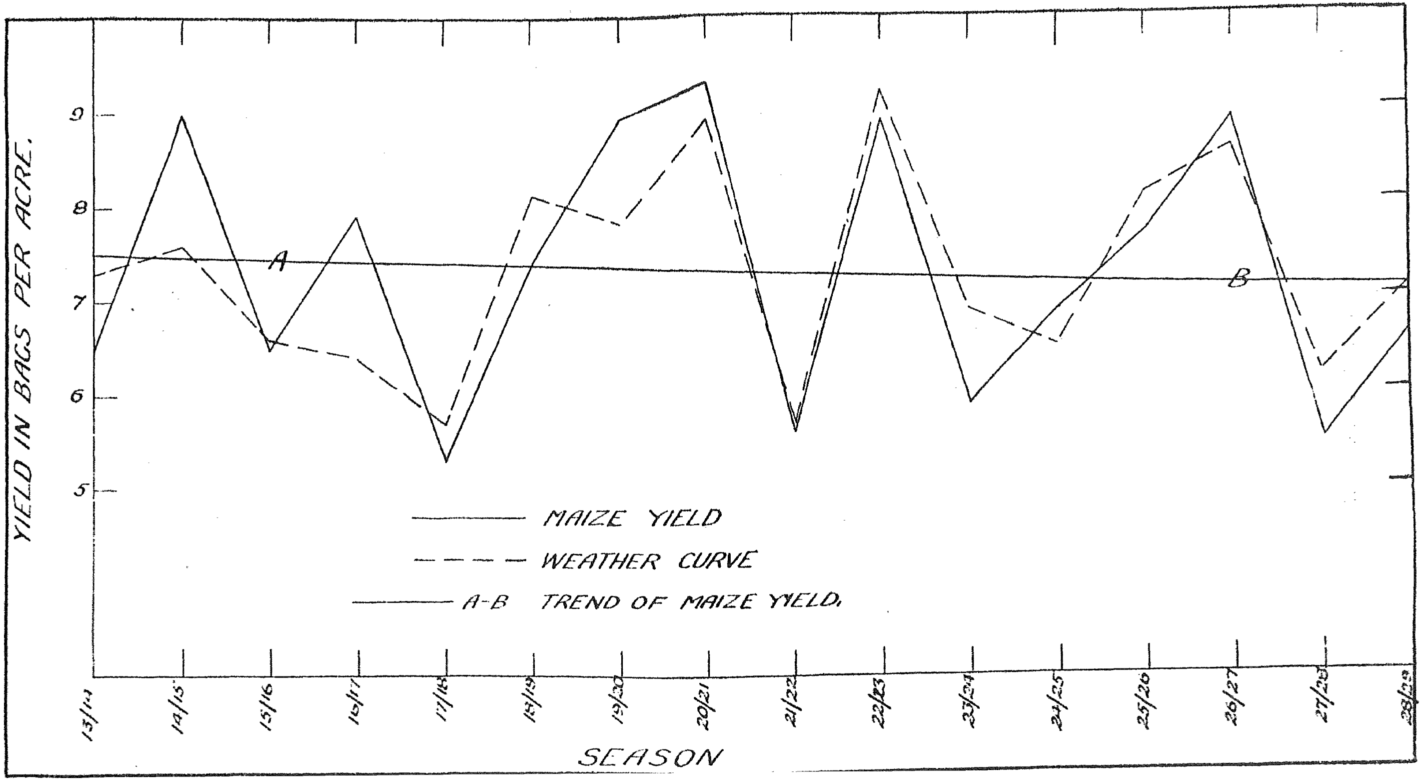
III. represents three-course rotation.

IV. represents four-course rotation.

Apart from the enormous variation in average yield shown, the slope of the "trend" line in the four cases is very striking.

Relation with Weather.—The results obtained at the Experiment Station are not very suitable for comparison with weather data, as the plots are small and the experiments in hand are not calculated to maintain a constant standard of yield. The final calculations were, therefore, made with the Mazoe figures on the assumption that in the wide area covered, the varying agricultural methods adopted by individual farmers would be masked in the mean. The statistics were, therefore, accepted without modification.

The standard correlation method was used for determining the various relationships, and for comparison the


YIELD IN BAGS PER ACRE.
9
8
7
6
5
A
B
MAIZE YIELD
WEATHER CURVE
A-B TREND OF MAIZE YIELD.
13/14
14/15
15/16
16/17
17/18
18/19
19/20
20/21
21/22
22/23
23/24
24/25
25/26
26/27
27/28
28/29
SEASON

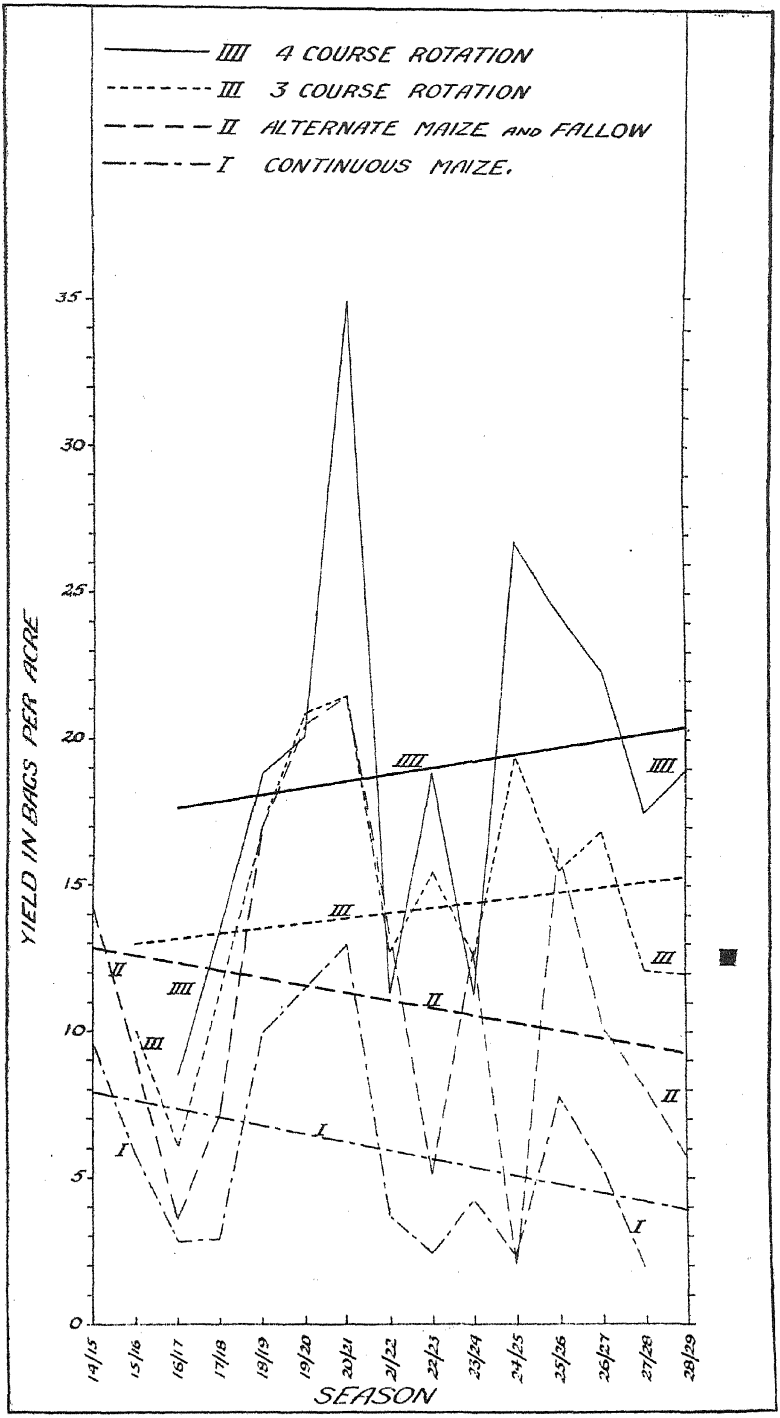

IIII 4 COURSE ROTATION
III 3 COURSE ROTATION
II ALTERNATE MAIZE AND FALLOW
I CONTINUOUS MAIZE.
YIELD IN BAGS PER ACRE
35
30
25
20
15
10
5
0
14/15
15/16
16/17
17/18
18/19
19/20
20/21
21/22
22/23
23/24
24/25
25/26
26/27
27/28
28/29
SEASON
IIII
III
II
I

Fig. II

meteorological factors were calculated in decades. The months, therefore, were divided as follows:—

Jan. 1 represents the period 1st to 10th January.
Jan. 2 represents the period 11th to 20th January.
Jan. 3 represents the period 21st to 31st January.

The abbreviated sign will be used throughout.

Correlation factors were calculated for the maize yield and rainfall from 1st November to 31st March, and with the sunshine at Salisbury for the period 1st December to 31st March.

The following table shows the factors obtained. The rainfall was taken from five stations suitably distributed in the area:—

Shamva—N.C.
Bindura—N.C.
Mazoe—N.C.
Avonduur.
Kilmer.

Correlation of Maize Yield with Weather Factors in Decades:

Table I.

Period.	Rainfall, Mazoe.	Sunshine, Salisbury.
November 1-10th (N1) ...	+ 0.40	
,, 11-20th (N2) ...	- 0.30	
,, 21-30th (N3) ...	- 0.36	
December 1-10th (D1) ...	- 0.20	+ 0.28
,, 11-20th (D2) ...	+ 0.31	- 0.33
,, 21-31st (D3) ...	- 0.23	+ 0.28
January 1-10th (J1) ...	—	+ 0.17
,, 11-20th (J2) ...	+ 0.22	+ 0.35
,, 21-31st (J3) ...	—	+ 0.42
February 1-10th (F1) ...	—	+ 0.27
,, 11-20th (F2) ...	+ 0.48	+ **0.51**
,, 21-28th (F3) ...	+ **0.56**	+ **0.66**
March 1-10th (M1) ...	+ 0.46	+ 0.43
,, 11-20th (M2) ...	—	+ **0.60**
,, 21-31st (M3) ...	+ 0.33	—

The significant figures in the above table are accentuated.

Correlation Factors.—The correlation factor is an arithmetical measure of the similarity of variation in two series of values. If two series of values are compared, and it is proved that when the one is high the other is high, and

vice versa, the correlation between them is positive and it will be some fraction approaching + 1.00; if the two series are identical, it will be + 1.00. If, on the other hand, the two series of values vary in opposite directions, i.e., the one is high when the other is low, the correlation between them is negative and its value will be some negative fraction approaching −1.00 as the series approach the direct opposite of each other. If the two series are directly the reverse of each other, the correlation will be −1.00.

It is seen then that correlation factors indicate the relation between two series directly or indirectly. If the series vary together, the correlation is positive; if they vary in opposite directions, the correlation is negative.

Coming now to the case of maize yield and rainfall, it may be said that if a positive correlation holds with rain, then the more rain the better the yield; if negative, then the less rain the better the yield. A small correlation does not mean that there is no relationship; it may mean that excess rain has as bad an effect as a deficit.

With the short series of data available, factors of less than 0.50 are too small to be considered.

An inspection of Table I., where the important factors have been indicated, shows that in February and March both the rainfall and sunshine show marked positive correlation. This indicates that in the Mazoe Valley the maize yield will be increased when the rainfall and sunshine are above normal during this period.

Adjacent periods were combined to find out whether this would improve the relationships, and the following values were obtained. F3M1 stands for the period 20th February to 10th March, etc.:—

Rainfall.	Sunshine.
F2F3M1 + 0.66	F3 + .61
	J2J3 + .66
	M2 + .60

The most important of these factors are F2F3M1 rain and F3 sunshine. The January sunshine factor is high, but shows a close relation to the other factors and has been dropped for the present.

The correlation between F2F3M1 rain and F3 sunshine is small and positive.

A regression equation was formed with these factors.

(Maize yield) = +0.54 (rainfall 11th Feb. to 10th March). +0.48 (sunshine 20th Feb. to 28th Feb.).

The theoretical combined value of this equation is R = +0.81. This means that the sunshine and rainfall during the above periods are responsible for approximately 40 per cent. of the variation of the maize yield.

The following table shows the maize yield for the period as excess or deficiency from the normal, the maize yield calculated from the above factors and the error of the calculated yield.

Figure 1 shows the same results graphically.

The full table of relationships between the above four factors and the maize yield is:—

	(1)	(2)	(3)	(4)	Maize yield.
1. F2F3M1—Rain ...	+1.00	+0.68	+0.24	+0.76	+0.66
2. J2J3—Sunshine ...		+1.00	+0.40	+0.72	+0.66
3. F3—Sunshine ...			+1.00	+0.31	+0.61
4. M2—Sunshine ...				+1.00	+0.60

An equation—combining the four factors—was worked out, with the following result:—

(Maize yield) = +0.40(1) +0.21(2) +0.41(3) +0.03(4)
R = 0.82.

This is a very slight improvement on the equation with two factors.

It is interesting to note the very close inter-relation between the weather factors.

Heavy rain in late February and early March is associated with excess sunshine in January and March and excess sunshine in late January, with excess sunshine in mid-March.

The period under review—16 years—is too short to draw hard and fast conclusions from these relations.

Considering the earlier equation with two factors only with R = 0.81, the standard deviation of error, if used to forecast the maize yield, would be 0.59 of the standard deviation of the maize yield. The latter for Mazoe over

16 years is 1.4 bags. The standard error would then be 0.83 bag and the probable error of any one forecast 0.55 bag or 7.5 per cent.

It was mentioned in the early part of this article that the maize yield showed a definite trend downwards. If due allowance is made for this and the weather factors adjusted to this trend, the correlation is raised from R = .81 to R = .84; the standard error is reduced from 0.59 to 0.54 or 0.76 bag, and the probable error of a forecast to 0.51 bag or 7 per cent.

Season.	Maize yield. Deviation in bags per acre.	Calculated deviation in bags per acre.	Difference.
1913-14	− 0.8	0.0	0.8
1914-15	+ 1.7	+ 0.3	1.4
1915-16	− 0.8	− 0.7	0.1
1916-17	+ 0.6	− 0.9	1.5
1917-18	− 2.0	− 1.6	0.4
1918-19	+ 0.1	+ 0.8	0.7
1919-20	+ 1.6	+ 0.5	1.1
1920-21	+ 2.0	+ 1.6	0.4
1921-22	− 1.7	− 1.6	0.1
1922-23	+ 1.6	+ 1.9	0.3
1923-24	− 1.4	− 0.4	1.0
1924-25	− 0.4	− 0.8	0.4
1925-26	+ 0.4	+ 0.8	0.4
1926-27	+ 1.6	+ 1.3	0.3
1927-28	− 1.8	− 1.1	0.7
1928-29	− 0.7	− 0.2	0.5
Std. Dev :	1.35	1.06	0.76

The Sand Veld Experiment Station, Marandellas.

By H. G. Mundy, Dip.Agric., F.L.S.,
Chief Agriculturist.

The acquisition by the Government of a granite sand farm in the neighbourhood of Marandellas affords the Department of Agriculture its first opportunity of carrying out long range field investigations into the numerous problems which confront the farmer on this type of land, which represents so large a proportion of the total area of the Colony.

The farm, which is 3,220 acres in extent, will be divided into four sections, consisting of (a) a demonstration sand veld farm, worked as nearly as possible on commercial lines and with careful costings kept of the operations, (b) a tobacco research station, (c) a pasture land research section, and finally (d) a crop experiment station. It is with the latter that these notes are concerned.

The farm was not acquired until towards the close of last rainy season, and although stumping, clearing and ploughing have been pushed forward as rapidly as possible, of the three hundred and fifty odd acres stumped and ploughed only a small proportion has been ploughed twice, and on the crop experimental section not more than fifty acres are expected to be available for experiments commencing this coming rainy season.

In order that sand veld farmers throughout the Colony may be afforded some idea of the investigations which in their interests will be conducted at this station, the following summary is given of the scheme of summer crop experiments already planned, and the most of which will commence this year.

Other investigations connected with field husbandry problems will be laid down as land becomes available, and as the results obtained disclose new points calling for investigation. In addition, an area of wet vlei land is being prepared for experiments with winter cereals, fodder crops and clovers and pasture grasses, and it is hoped later it may be possible to provide a limited area of land for experiments with crops under irrigation. The scheme also contemplates provision for plant breeding. A Plant Breeder will be resident on the station and will co-operate with the Tobacco Division, as well as being employed on work with wheats for rust resistance and improvement in yield and quality. As circumstances permit, attention in this direction will also be given to maize, oats and certain of the legumes.

INITIAL SERIES OF SUMMER CROP EXPERIMENTS.

Series No. 1.—Maize with a complete fertiliser dressing underplanted with cowpeas each year, compared with alternate maize, and cowpeas ploughed under—the maize receiving the same fertiliser treatment. The standard dressing of complete maize fertiliser applied (a) every year, (b) every second year, (c) every third year.

The above methods of cropping compared with a three-course rotation, consisting of maize with complete fertiliser, maize untreated, cowpeas ploughed under.

The objects of the experiment are to test the efficacy of annually planting cowpeas under the maize as a means of maintaining the organic matter supply of the soil, and to compare this treatment with a complete green manuring; also to compare the effects of green manuring at different intervals of time and to compare the relative economy of frequent and less frequent applications of a standard fertiliser.

Series No. 2.—Maize alternating with Sunn hemp ploughed under. In one range of plots superphosphates and potash are applied direct to the maize, and in another the same dressing is applied to the green manure crop. The above system is compared with Sunn hemp ploughed under, followed by (a) two successive crops of maize, (b) three successive crops of maize. Combined with the latter investigation is an enquiry into the relative effects of applying the

same fertiliser dressing to (1) each of the maize crops, (2) two out of the three maize crops, and (3) to all three maize crops.

The objects here are to ascertain the lasting effect on this type of soil of a green manuring with Sunn hemp, to compare the effect of applying fertiliser direct to the maize as against applying it to the green manure crop, and to provide a check against Series No. 1 in respect to the relative economy of frequent *versus* less frequent applications of fertiliser.

Series No. 3.—Consists of plots under a four-course rotation, in which maize is the major crop. A dressing of eight tons per acre of farm manure once in four years is compared with a green manuring with Sunn hemp, reinforced with rock phosphate, at similar intervals. The rotation is planned and fertilisers are applied with a view of maintaining the land in a high state of fertility.

Series No. 4.—Consists of a range of plots under a somewhat more varied four-course system. Farm manure is again compared with a green manuring with Sunn hemp, but in this case rock phosphate is omitted. In both series 3 and 4 an index crop of maize immediately follows the application of farm manure and the green manuring.

Series No. 5.—Demonstrates a five-course rotation believed to be suitable for a mixed farming proposition on the sand veld, and is planned on lines which are expected adequately to maintain the fertility of the soil. Two-fifths of the land each year are under maize, two-fifths under succulents and legume hays and one-fifth under grass hay crops and oil seeds respectively.

Series No. 6.—Here maize is the index crop, and similar dressings of farm manure at frequent and less frequent intervals are compared. A further comparison is made of reinforcing the standard application of manure with a dressing of rock phosphate, and this again is compared with a range of plots to which, in addition to the farm manure, superphosphates instead of rock phosphate are applied.

Series Nos. 7 and 8.—Consist of fertiliser trials on the maize crop, different fertilisers and different rates of application per acre being compared. The land is worked on a

four-course rotation consisting of three successive maize crops, followed by a green manuring with Sunn hemp. Eighty plots are involved: on forty the fertiliser treatments commence on virgin land, and on the other forty the land is green manured the first year and the fertiliser treatments are commenced in 1931-32 after the green manuring. Phosphate is applied in the form of superphosphate, rock phosphate and basic slag, and on certain of the plots varying amounts of potash salts are added to the phosphatic dressing. Where a complete fertiliser is used, applications of nitrogen applied in an organic form are compared with similar applications of inorganic nitrogen.

Series No. 9.—Compares flat cultivation of maize on this light type of soil with maize planted on the ridge, and again with maize ridged once and ridged twice during its period of growth.

Series No. 10.—Is a straight green manuring experiment, in which the effect on the soil of ploughing under the different standard green manure crops of the Colony is investigated. The effect of these complete green manurings is also compared with the growing of the same crops for hay or seed and ploughing in of only the stubble.

Series No. 11.—This range of plots investigates the suitability of various kinds of legumes for planting under maize to provide green fodder to be fed off by stock or ploughed under. The relative growth of the legumes when sown under maize planted at different distances, namely, 36 x 36 ins., 42 x 15 ins. and 42 x 18 ins., is also compared.

Series No. 12.—Comprises maize variety trials with the standard breeds of the Colony. Two crops of maize are grown, followed by a green manuring.

Series No. 13.—Comprises variety trials with ground nuts.

Series No. 14.—Consists of fertiliser trials with ground nuts, the fertilisers applied consisting of superphosphate, rock phosphate, bone and superphosphate, basic slag, potassic superphosphate and a complete fertiliser.

Series No. 15.—Embraces a wide range of leguminous crops, to test their relative suitability on light sandy soils as (a) hay crops, (b) seed producers. Amongst other

legumes are included soya beans, dolichos beans, cowpeas and velvet beans. The effect of growing these crops continuously on the same land in relation to root-nodule formation and the incidence of disease and insect attack will be studied.

Series No. 16.—Consists of variety trials with soya beans for yield of hay and seed.

Series No. 17.—Consists of an extensive range of pure and mixed hay crops, mostly of the grass family, but in some cases comprising a mixture of grass crops and legumes. Similar applications of superphosphate *versus* basic slag are compared.

Series No. 18.—Covers variety trials with sweet potatoes to ascertain whether any of the standard varieties at present grown are particularly suited to this type of soil.

Series No. 19.—Comprises an extensive series of liming experiments on maize underplanted with cowpeas. Different rates of application of lime are compared with "no lime" plots, and as the experiment progresses additional applications of lime at varying intervals of time will be made to certain of the plots in order to study the effect of frequent compared with less frequent applications.

Series No. 20.—Is a further extension of No. 19. Here a four-course rotation receiving a standard dressing of lime once every four years is compared with a similar rotation in which no lime is applied. The land in each case is maintained in a high state of fertility by means of green manuring and the frequent application of artificial fertilisers. The effect of the lime treatment on different crops in the rotation will be studied, together with its effects on the first, second, third and fourth crop, following the application.

Series No. 21.—Consists of a trial of the relative merits of sweet potatoes *versus* edible canna as succulent stock feeds on this type of land.

Series No. 22.—Forty-two plots are involved and are devoted to fertiliser trials with Irish potatoes. Different fertilisers and different rates of application are compared (a) on virgin land, (b) on land which has been green manured with Sunn hemp. The effect of spraying with

Bordeaux Mixture as a preventative against early blight will be studied.

Series No. 23.—This series does not commence until 1931-32. It is an extension of the potato fertiliser trials and involves comparative trials with different rate applications of farm manure, combined with different rate applications of artificial fertilisers. It is so planned that results with farm manure as a basic treatment of the land can be compared with green manuring as the basic treatment. The economy or otherwise of spraying with Bordeaux Mixture will again be noted.

Series No. 24.—Consists of a trial of various grain crops, including munga and ropoko, compared with maize and kaffir corn. It also covers different methods of seeding the native grain crops.

Series No. 25.—Comprises variety trials with wheats which give promise of being suitable as summer crops. These experiments will link up with the wheat breeding work to be undertaken by the Plant Breeder.

Kraal Manure: Measurements for Application.

The following information has been supplied to us by the Agriculturist of the Native Development Department, and is published as an item of general interest.

A total of 45 bags were filled with kraal manure and weighed. The maximum weight for dry surface manure (dusty manure) was 89 lbs., the minimum 64 lbs., the average being 75 lbs. Manure dug from under the surface varied in weight from 114 lbs. to 202 lbs. per bag, the average weight being 137 lbs. This manure was dug out early in July, at which time it contained a considerable percentage of moisture. It was estimated that manure dug

out in September and October, which is the usual time for making applications by natives, would average approximately 100 lbs. per bag. Bags were emptied into two different sized Scotch carts and into 12 ft., 14 ft. and 16 ft. wagons.

(1) A small Scotch cart, capacity 18 8-10 cubic feet, held 5½ bags of manure heaped up.

(2) A larger Scotch cart, capacity 29 1-10 cubic feet, held 8 bags of manure heaped up.

(3) A 12 ft. wagon with side rails covered and heaped up with manure held 20 bags of manure.

(4) A 14 ft. wagon loaded as above held 24 bags of manure.

(5) A 16 ft. wagon loaded as above held 28 bags of manure.

From the above figures, if an average weight of 100 lbs. per bag is taken for manure—

(1) a small-sized Scotch cart will hold a little more than ¼ of a ton;

(2) a medium-sized Scotch cart would hold 2-5ths of a ton.

(3) a 12 ft. wagon would hold 1 ton.

(4) a 14 ft. wagon would hold 1 1-5 tons.

(5) a 16 ft. wagon would hold 1 2-5 tons.

Southern Rhodesia Veterinary Report.

June, 1930.

AFRICAN COAST FEVER.

One animal showing symptoms of the disease was destroyed on the infected farm Schaapplaats, Melsetter district. Microscopic examination positive. No cases at any of the other centres.

TRYPANOSOMIASIS.

One case reported at Gatooma, two at Melsetter and 93 in the Wankie area.

QUARTER EVIL.

A few cases reported in several districts.

HEARTWATER.

Cases occurred amongst calves in the Victoria district, and the animals were treated with quinine hydrochlorate, with apparent satisfactory results.

TUBERCULOSIS.

A bull in the Gwelo district was destroyed in May, showing symptoms of this disease; the in-contact animals were tested with tuberculin and gave negative results.

Three animals when tested on importation reacted and were destroyed.

HORSE-SICKNESS.

Three deaths reported.

SCAB.

One flock placed in quarantine in Victoria district.

GENERAL.

A number of deaths in cattle occurred on the Central Estates, Gwelo district, which have been attributed to

"Snotsiekte." There is a large number of wildebeest on this property, and the management are taking steps to reduce them.

Arrangements are being made for the treatment of fly-stricken animals on certain farms in the Gatooma area, for which purposes a central camp has been erected and a reserve supply kept for replacement of the infected animals as received for treatment.

IMPORTATIONS.

From Union of South Africa: Bulls 22, heifers 79, horses 17, mules 98, sheep 2,233, pigs 6. From Bechuanaland: Sheep 767, goats 480, pigs 49.

EXPORTATIONS.

To Union of South Africa: Johannesburg, for local consumption, 1,132; Durban, for overseas, 2,660. To Belgian Congo: Slaughter 1,810, breeding 11. To Northern Rhodesia: Slaughter 407.

EXPORTATIONS (MISCELLANEOUS).

To Northern Rhodesia: Sheep 160, goats 27, pigs 120. To Belgian Congo: Pigs 170. To Union of South Africa: Pigs 85.

J. M. SINCLAIR,
Chief Veterinary Surgeon.

Owing to an oversight, the veterinary reports for the months of January, February, March and April of the present year were not sent to us for publication. The following is the position in regard to **African Coast Fever:—**

JANUARY, 1930.

Melsetter District.—Microscopic examination of preparations from a calf which died on the farm Schaapplaats showed Coast Fever. No further mortality. This farm has been under close supervision because of a suspicious case which occurred in June last.

Mazoe District.—Four cases occurred at the infected centre of the Chiweshe Reserve.

FEBRUARY, 1930.

Gwanda District.—An outbreak occurred on the farm Deneys. Mortality, two head. Arrangements are being made for the disposal of the herd by slaughter. This farm was infected previously; the last case recorded was in June, 1927.

Charter District.—An outbreak occurred on the farm Inhoek. Mortality, nine head. This farm was infected previously; the last case recorded was in February, 1925.

Melsetter District.—One death on the infected farm Wolfscrag.

MARCH, 1930.

Mazoe District.—The slaughter of the infected herds on the farm Villa Franca and the Chiweshe Reserve was completed.

Charter District.—Six cases of Coast Fever occurred on the farm Inhoek. The slaughter of the infected herd is proceeding.

Gwanda District.—The slaughter of the infected herd on the farm Deneys was completed. Two head were found to be affected with Coast Fever.

APRIL, 1930.

Charter District.—Mortality, one; Inhoek Farm. The slaughter of the infected herd was completed.

Southern Rhodesia Weather Bureau.

JULY, 1930.

Pressure.—The barometric pressure was about normal during the month, being lowest at Bulawayo, with 0.026 in. below normal, and highest at Livingstone, with 0.006 in. above normal.

Temperature.—Temperatures were generally very much below normal. The mean monthly temperature varied from 4.0° F. below normal at Gatooma to 0.7° F. below normal at Salisbury. The mean maximum temperatures varied from 5.2° F. below normal at Gatooma to 0.8° F. below normal at Enkeldoorn. The mean minimum temperatures varied from 4.0° F. below normal at Matopos to 0.1° F. above normal at Melsetter and Salisbury. Temperatures below freezing at screen height 4 feet were recorded at Gwanda, Fort Victoria, Gwaai, Holly's Hope, Matopos, Nuanetsi and Riverdene North.

Rain.—Light showers were recorded at a number of stations.

RAINFALL.

ZONE A.—

Bulalima-Mangwe—	
Riverbank	0.08
Bulawayo—	
Keendale	0.11
Observatory	0.02
Insiza—	
Thornville	0.07
Umzingwane—	
Springs	0.07
Wankie—	
Victoria Falls	0.01

ZONE B.—

Chibi—

Bubye	0.34
Nuanetsi N.C.	0.35

Gwanda—

Limpopo	0.20

Insiza—

Albany	0.16

Umzingwane—

Balla Balla	0.22

ZONE C.—

Charter—

Enkeldoorn	0.17
The Range	0.07

Chilimanzi—

Beacon Hill	0.03

Gwelo—

Lalapanzi	0.03
Elvington	0.49

ZONE D.—

Inyanga—

Juliasdale	0.26

Makoni—

Eagle's Nest	0.51

ZONE E.—

Bikita—

Bikita	0.45

Chibi—

Chibi	0.06

Chilimanzi—

Allanberry	0.09
Felixburg	0.04
Induna Farm	0.02
Mtao Forest	0.01
Mukowries	0.10
Thornhill	0.05

Gutu—	
Alheit Mission	0.10
Devuli Store	0.07
Gutu N.C.	0.08
Glenary	0.05
Gwelo—	
Glencraig	0.01
Insiza—	
Stoneham (Brae Valley)	0.10
Makoni—	
Craigendoran	0.03
Forest Hill	0.03
Monte Cassino	0.33
Marandellas—	
Macheke	0.09
Melsetter—	
New Year's Gift	0.56
Ndanga—	
Doornfontein	0.96
Selukwe—	
Rio	0.33
Selukwe	0.15
Umtali—	
Embeza	0.30
Fern Valley	0.23
Jerain	0.18
Mountain Home	0.23
Mutumbara Mission	0.02
Odzani Power Station	0.25
Park Farm	0.08
Stapleford	0.36
St. Augustine's Mission	0.28
Umtali Gaol	0.58
Victoria—	
Cambria	0.13
Chevenden	0.13
Kimberley Ranch	0.02
Mashaba	0.06
Miltonia	0.07

Riverdene North	0.03
Silver Oaks	0.12
Stanmore	0.08
Victoria	0.11

ZONE F.—

Melsetter—

Chikore	0.18
Lettie Swan	0.10
Melsetter	0.57
Mount Selinda	0.07

Umtali—

Cloudlands	0.30

Dates of Meetings of Farmers' Associations, Southern Rhodesia.

Name of Association.	Place of Meeting.	Secretary.	Sept.	Oct.
			1930	1930
Ayrshire—Sipolilo	Various farms	G. H. Cautherley	13	11
Banket Junction	Banket Hotel	A. M. Hutchinson	6	4
Beatrice District	Farmers' Hall, Beatrice	W. Krienke	25	30
Bindura	Bindura Farmers' Hall	W. E. Fricker	12	10
Bromley	Farmers' Hall, Bromley Siding	E. Taylor	3	1
Bubi	Queen's Mine	W. H. Perham	20	17
Bulawayo Landowners' and Farmers' Association	Library Buildings, Bulawayo	T. B. Hepburn	2	7
Chakari	Various farms	R. Codrington	18	16
Daisyfield	Somabula (Sept.), Daisyfield (Oct.)	L. E. Edwards	13	18
Darwendale—Trelawney	Various farms	Charles H. Tanner	24	22
Eastern Districts	Farmers' Hall, Chidza	W. E. Richards	13	11
Enkeldoorn	Enkeldoorn	C. N. Ludlowe	2	7
Enterprise	Farmers' Hall	E. P. Venables	2	7
Essexvale	Essexvale	Col. D. Judson	21	18
Felixburg—Gutu	Various farms	E. C. Fleetwood	13	11
Figtree Branch, R.L. and F.A.	Figtree Hotel	The Secretary	2	7
Gadzema	Gadzema Hotel	H. G. M. Liddell	12	10
Gatooma	Speck's Hotel	Col. J. A. Smith	20	18
Gatooma (Golden Valley Branch)	Golden Valley Hotel	C. K. James	13	11
Gazaland (South Melsetter)	Farmers' Hall, Chipinga	J. Ward	20	18
Greystone	Quarrie Farm	P. J. van der Walt	13	...
Gwanda	Lowenthal's Building, Gwanda	N. J. B. Nilson	20	18
Hartley	Hartley Hotel	Mrs. F. C. Watson	13	11
Headlands	Headlands	J. A. Eve	...	...
Hunter's Road	Hunter's Road	R. W. Twilley	27	25
Insiza South	Farm Lancaster	J. Campbell	11	...
Inyazura	Inyazura	W. P. Fd d	...	3
Lalapansi	Lalapansi	A. Watt	13	11
Lomagundi	Sinoia	James S. Brown	...	10
Lomagundi West	Various farms	A. A. Bisset	14	12
Macheke	Various farms	R. O. Jackson	...	...

Macheke Valley (Headlands) Farmers' and Tobacco Growers' Association	Various Farms	T. R. Colam	6	4
Makwiro	Makwiro	W. L. Parsons	19	17
Marandellas	Marandellas Farmers' Hall	E. Cruikshank	5	3
Marandellas, Southern	Various farms	B. V. Cherry	3	1
Mashonaland	Mashonaland Farmers' Hall, Salisbury	P. Wilson	12	10
Matobo South	Farmers' Hall, Malundi Farm	W. S. George	20	18
Matopo Branch, R.L. and F.A.	Farmers' Hall, Malundi	W. Mirtle	20	18
Mazoe (Concession)	Various farms	Douglas Southey	12	10
Mazoe (Glendale)	Farmers' Hall, Glendale	Mrs. A. G. McCall	10	8
Melsetter	Court House, Melsetter	Capt. E. H. Allott	13	11
Ngezi-Umniati	Harvieston, Enkeldoorn	Miss Harvie	27	25
North Melsetter	Various farms	P. F. de Bruyn	13	11
North Umniati	———	J. F. Eagar	Not	received
Norton and Lydiate District	Norton	A. Jones	5	3
Nyamandhlovu	Nyamandhlovu	R. D. McLean	...	...
Odzi District Farmers	Odzi Hotel	M. Goldberg	6	4
Poorte Valley	Various places	A. D. Wilson	20	18
Que Que	Offices of the Que Que Sanitary Board	A. A. Ackerman	20	18
Rusape Farmers' Association	Rusape	E. C. Harrington	6	4
Salisbury South	Various farms	P. Linton	24	29
Shamva	Shamva Court House	L. H. S. Paxton	19	17
Shamva North	Various farms	Mrs. E. J. Stevenson	20	18
Two Rivers Farming Association	Various farms	W. L. Parsons	20	18
Umboe (Branch of Lomagundi F.A.)	Various farms	G. T. Gover	13	11
Umvukwe Farmers' and Tobacco Growers' Association	Various ranches	Com. Wrightson	13	11
Umtali	Drill Hall, Umtali	A. Howat	4	2
Umvuma and District	Court House, Umvuma	S. T. Montgomery	19	17
Victoria	Victoria	J. A. Halliday	6	4
Wankie District	———	F. H. Going	Not	received
West Umvukwe Farmers' Association	Various farms	G. H. Gordon	6	4
Western	Plumtree Hotel	The Secretary	13	11
Willoughbys	Willoughbys	A. E. Roberts	Not	received

Export of Cattle from Southern Rhodesia, 1930.

Month	Union		England.	Congo		N. Rhodesia.		Portuguese East Africa.		Total
	Slaughter		Slaughter							
	Johannesburg	I.C.S. for overseas	On hoof	Slaughter	Breeding	Slaughter	Breeding	Slaughter	Breeding	
January ...	...	...	...	2,449	67	...	...	...	...	2,516
February ...	...	...	..	3,438	8	537	91	...	11	4,085
March ...	25	...	160	1,097	...	249	...	...	7	1,538
April ...	53	863	...	2,636	115	120	16	...	...	3,803
May ...	783	1,628	160	1,517	593	268	176	...	...	5,125
June ...	1,132	2,660	...	1,810	11	407	...	...	..	6,020
July ...	1,273	5,505	...	1,525	2,257	299	128*	...	...	10,987
August ...										
September ...										
October ...										
November ...										
December ...										
	...	...	...	...	...	...	...	...	...	...

* Trek oxen.

Rhodesian Milk Records.

Official Milk Records.

Name of cow.	Breed.	Date of Birth.	Milk in lbs. to date.	Butter fat in lbs. to date.	No. of days.	Name and address of owner.
Morgenzon Kleinhans	Friesland	29.1.24	5,225.50	177.33	300	W. R. Blackwell, Norton
Morgenzon Symphony	do	24.9.23	6,109.10	232.10	240	do do
Morgenzon Kleingoed	do	13.1.24	5,543.90	203.26	240	do do
Morgenzon Astralia	do	18.6.24	4,188.70	143.85	180	do do
Morgenzon Ermine	do	4.7.24	5,545.00	184.64	300	do do
Morgenzon Nonaber	do	28.1.24	5,032.80	196.10	300	do do
Dunoran Pearl	do	4.2.20	2,892.60	98.06	120	do do
Delmore Myth	do	10.5.25	2,083.50	62.92	90	G. M. Huggins, Salisbury
Avondale Pel May II	do	20.5.25	850.50	28.70	60	do do
Avondale Melkbron	do	16.11.25	444.00	13.36	30	do do
Princess Park Sunbeam's Primrose	do	1.11.26	8,831.00	311.81	330	G. A. Lyons, Bulawayo
De Grendel Hancy	do	23 9.23	15,193.00	475.87	300	do do
Thibet Park Dainty	do	25.11.21	6,976.50	214.67	120	do do
Thibet Park Zenobia	do	4.8.22	6,932.50	229.45	120	do do
Vermaakskraal Matje	do	22.8.24	3,707.00	115.09	60	do do
Thibet Park Edith	do	8.8.25	4,548.00	148.64	90	do do
Vermaakskraal Zwarta	do	6.5.26	3,702.00	135.06	90	do do
Planchette of Tolosa	do	10.10.24	6,375.90	205.41	270	F. B. Morrisby, Gwelo
Riverview Mary	do	10.12.22	6,027.90	213.95	240	do do
Erin-go-Bragh Xmas Gift	do	25.12.25	2,954.50	100.85	150	do do
Aanvang Voekje II	do	—	1,713.50	52.09	30	do do
Burnbrae Charm	Ayrshire	15.4.22	3,528.80	131.801	150	E. MacPherson, Figtree
Maldon Broadhooks	Shorthorn	18.6.25	3,465.00	136.15	300	Roberts & Letts, Heany Junction
Maldon Dot	do	27.4.26	2,453.00	95.545	240	do do
Maldon Active Girl	do	5.9.26	1,874.50	69.89	90	do do

RHODESIAN MILK RECORDS (continued).

Official Milk Records (continued).

Name of cow.	Breed.	Date of Birth.	Milk in lbs. to date.	Butter fat in lbs. to date.	No. of days.	Name and address of owner.
Maldon Aurora	Shorthorn	26.5.22	3,092.00	111.65	210	Roberts & Letts, Heany Junction
Maldon Camellia	do	30.7.24	2,472.50	109.86	210	do do
Maldon Emblem	do	3.5.26	1.728.50	66.27	150	do do
Maldon Dairymaid	do	25.6.25	1.519.00	64.11	120	do do
Maldon Fatima	do	—	1,017.50	36.78	90	do do
Maldon Wild Queen	do	—	673.50	24.65	30	do do
Whinburn Daphne	Friesland	2.9.26	6,534.60	215.11	300	R. R. Sharp, Redbank
Middleton's Zoe	do	14.5.22	7,728.70	244.01	266	do do
Whinburn Spottie	do	27.6.22	7,102.00	253.12	300	do do
Whinburn Annette	do	16.7.26	5,597.40	191.38	300	do do
Whinburn Primrose	do	10.12.21	6,047.00	266.56	270	do do
Middleton's Pamphylia	do	1.1.22	6,867.50	228.10	270	do do
Whinburn Zephyr	do	8.7.22	4,858.90	159.11	270	do do
Whinburn Pansy	do	22.12.24	5,931.10	190.69	270	do do
Eldorado Volsante	do	4.9.26	3,864.30	123.33	150	do do
Venter's Rust Rika	do	10.7.26	4,114.70	132.26	150	do do
Eldorado Pourquoi	do	10.9.26	3,695.70	110.59	120	do do
De Grendel Boukje	do	12.6.25	6,816.50	257.83	240	A. F. Valentine, Old Umtali
Groenvlei Bedford Alberta	do	15.9.18	8,168.95	253.95	210	P. T. Webb, Iron Mine Hill
Sheep Run Duchess	do	29.4.26	4,435.25	137.40	150	do do
Albert Vale Zuineg	do	23.11.23	5,978.50	210.69	240	F. Zeender, Insiza
Albert Vale Spinnekop	do	22.8.23	5,270.50	169.57	210	do do
Tell Riggie	do	1.4.26	4,558.00	141.46	210	do do
Albert Vale Nil B. III.	do	27.11.23	5,087.50	162.91	240	do do
Thibet Park Myrtle	do	30.11.21	4,554.50	162.38	180	do do
Thibet Park Olive IV.	do	20.4.24	6,668.00	237.88	180	do do
Albert Vale Kruppel C.	do	24.8.23	4,940.50	157.42	150	do do

RHODESIAN MILK RECORDS (continued).

Official Milk Records (continued).

Name of cow.	Breed.	Date of Birth.	Milk in lbs. to date.	Butter fat in lbs. to date.	No. of Days.	Name and address of owner.
Wolseley Vera II.	Friesland	23.12.21	5,236.00	175.49	150	F. Zeender, Insiza
Thibet Park Sylvia	do	20.7.24	3,444.00	122.30	120	do do
De Grendel Selma	do	8.11.29	10,863.5	312.30	360	Govt. Farm, Gwebi
Melrose Corrie	do	1.4.23	9,453.00	262.42	270	do do
Madge of Batavia	do	7.11.26	6,928.50	220.67	295	do do
Gwebi Beryl	do	22.10.26	3,678.00	124.54	230	do do
De Grendel Bessie Burger	do	28.10.21	8,015.00	261.68	270	do do
Gwebi Bunty	do	19.10.27	4,485.50	162.58	210	do do
Melrose Roosje	do	2.10.20	1,129.00	166 27	180	do do
Enterprise Astra	do	—	2,042.50	57.76	90	do do
Mimosa Clara X	do	—	1,445.00	43.78	30	do do
Gwebi Stella	do	—	634.50	21.51	30	do do
De Grendel De Hoop	do	9.8.22	2,400.00	79.81	90	do do
Brightwell Rain	Red Poll	25.4.26	8,064.10	263.57	330	Govt. Farm, Matopos
Drinkstone Missie	do	31.12.26	6,264.20	237.03	240	do do
Threave Flowergirl	Ayrshire	7.4.27	6,733,20	304.09	240	do do
Valleyfield Rose Marie	do	2.3.27	2,061.30	72.39	90	do do
Barglass Chrissie	do	5.5.27	2,336.40	85.91	90	do do
Barglass Bellcat	do	—	919.20	32.82	60	do do
Sandhill Heatherbloom	do	—	1,469.60	55.97	60	do do
Barglass White II	do	—	476.90	38.57	60	do do
Martlesham Circe	Red Poll	—	1,321.00	47.17	60	do do
Kirton Stella	do	—	732.40	27.98	60	do do

RHODESIAN MILK RECORDS (continued).

Semi-official Milk Records.

Name of cow.	Breed.	Milk in lbs. to date.	Butter fat in lbs. to date.	No. of days.	Name and address of owner.
Primrose ...	Grade Friesland	4,974.30	189.67	284	W. R. Blackwell, Norton
Waterbloem ...	do	4,488,40	160.04	300	do do
Kleinbloem ...	do	5,837.20	201.04	300	do do
Mooibloem ...	do	5,138.20	199 09	300	do do
Glen Arum Buttercup	Shorthorn	2,645.60	100.74	150	C. G. Cooper, Essexvale
Lorna ...	Grade Shorthorn	2,637.00	114.45	161	do do
Glen Arum Susannah	Shorthorn	2,957.30	110.08	150	do do
Glen Arum Flora	do	1,337.60	40.06	120	do do
Bella ...	Grade Shorthorn	1,916.60	66.59	90	do do
Snowdrop ...	do	1,315.90	55.05	90	do do
Zazkins ...	do	2,229.10	99.27	90	do do
Zazola ...	do	1,327.20	73.55	60	do do
Pepper ...	do	669.40	27.44	30	do do
Lady Jane ...	do	334.00	12.89	30	do do
Dunoran Alta ...	Friesland	3,650.00	105.49	150	Huckle Bros., Inyati
D. Tottie II. ...	do	2,900.00	104.12	150	do do
D. Moffie ...	do	2,138.50	71.45	150	do do
D. Violet ...	do	2,920.50	87.58	150	do do
Pumpkin ...	Grade Friesland	1,529.50	49.47	90	G. M. Huggins, Salisbury
Patricia ...	Grade Shorthorn	4,954.00	192.91	270	D. Jarvis, Gwelo
Jewel ...	do	1,339.75	44.32	120	do do
Sylvia ...	do	2,385.00	96.63	180	do do
Despatch Affinity	Shorthorn	1,890.25	80.35	180	do do
Prudence ...	Grade Shorthorn	1,990.00	75.61	150	do do
Despatch Antoinette	do	789.25	25.66	90	do do
No. 6 ...	Grade Friesland	764.00	27.73	30	E. C. Kilburn, Macheke
No. 5 ...	do	643.50	23.80	30	do do
Erin-go-Bragh Anne	Friesland	1,889.70	55.78	60	W. S. Mitchell, Iron Mine Hill
Barbara I. ...	Grade Friesland	7,377.90	251.68	240	F. B. Morrisby, Gwelo
Freezia ...	do	9,078.90	308.93	300	do do
Youth ...	do	6,559.20	204.38	241	do do
Daffodil ...	do	5,227.00	161.04	210	do do
Beauty ...	do	3,136.90	99.89	120	do do
Zeilie ...	do	2,208.50	95.13	120	do do
Largesse ...	do	2,366.70	96.61	90	do do
Emily ...	do	2,170.20	73.58	90	do do
Violet ...	do	1,860.50	64.56	60	do do
June ...	do	946.90	26.70	30	do do

RHODESIAN MILK RECORDS (continued).

Semi-official Milk Records (continued).

Name of cow.	Grade.	Milk in lbs. to date.	Butter fat in lbs. to date.	No. of days.	Name and address of owner.
Patience ...	Grade Ayrshire	1,584.00	53.66	90	E. E. MacPherson, Figtree
Freckles ...	do	2,375.30	92.14	120	do do
Redbank No. 165	Grade Shorthorn	7,128.00	267.47	270	Roberts & Letts, Heany Junction
Bochen Sheila No. 127	do	5,932.00	204.90	270	do do
Nyondu No. 50	do	3,638.50	151.256	210	do do
Moff No. 156 ...	do	2,586.50	94.43	150	do do
M. Serjeant No. 79	do	2,687.50	108.05	150	do do
Afric No. 122 ...	do	2,546.00	91.27	120	do do
Sugar No. 105	do	1,659.50	62.17	90	do do
Mscopie No. 159	do	2,707.00	107.97	90	do do
Moff No. 163 ...	do	1,645.50	56.55	90	do do
Redbank No. 33	do	1,728.50	64.63	90	do do
Busie No. 38 ...	do	2,504.00	96.15	90	do do
Shore No. 15 ...	do	1,413.50	54.52	60	do do
Whinburn Linnet	Grade Friesland	10,320.50	293.93	300	R. R. Sharp, Redbank
Whinburn Buttercup	do	8,852.50	298.22	300	do do
Whinburn Butterfly	do	6,263.50	197.91	270	do do
Whinburn Sidi	do	5,702.00	169.82	270	do do
Whinburn Blackbird	do	7,477.00	246.09	300	do do
Wren ...	do	5,146.00	165.06	210	do do
Whinburn Plush	do	4,204.50	118.45	180	do do
Bess	do	2,505.00	108.40	180	M. S. Smith, Gwelo
Martha ...	do	3,750.50	179.25	260	do do
Molly ...	do	4,906.00	188.52	229	do do
Thora ...	do	3,969.50	154.86	260	do do
Star	do	3,649.00	122.29	300	do do
Grace ...	do	5,139.50	202.06	270	do do
Flora	do	4,542.50	162.93	270	do do
Ugly	do	3,485.50	186.61	210	do do
Wendy ...	do	4,814 00	216.56	240	do do
Midget ...	Grade Kerry	4 439.00	183.335	240	do do
Doreen ...	Grade Friesland	4,067.50	133.33	240	do do
Biddy II ...	do	3,735.00	130.76	180	do do
Dot	do	2,310.50	196.10	150	do do
Spring Grove Seale	Grade S. Devon	1,528.00	59.75	120	do do
Victoria ...	do	4,072.00	171.61	245	do do
Jane	Grade Shorthorn	3,434.50	147.87	240	do do
Rose	Grade Kerry	3,019.00	109.20	150	do do
Gwen ...	Grade Friesland	2,372.00	86.55	120	do do

RHODESIAN MILK RECORDS (continued).

Semi-official Milk Records (continued).

Name of cow.	Grade.	Milk in lbs. to date.	Butter fat in lbs. to date.	No. of days.	Name and address of owner.
Bluff Hill Flora	Friesland	2,672.00	59.03	120	L. A. Stonard, Salisbury
Palm Tree Rene	do	781.00	26.32	30	do do
Jean	Grade Friesland	718.00	28.72	30	A. F. Valentine, Umtali
Molly ...	do	1,575.50	55.30	60	do do
Rathwick Pietjie	Friesland	3,056.50	100.65	120	do do
Surprise ...	Grade Friesland	4,522.70	174.76	210	P. T. Webb, Iron Mine Hill
Bess	do	4,017.15	175.04	210	do do
Sheep Run Laura	do	2,990.85	134.38	180	do do
Whitesides ...	do	2,923.60	103.67	150	do do
Gertie ...	do	2,670.40	87.47	90	do do
Gwebi Sunshine	do	6,181.50	226.09	300	Govt. Farm, Gwebi
Gwebi Aglie ...	do	3,961.50	142.87	240	do do
Gwebi Janie ...	do	5,234.00	203.99	240	do do
Gwebi Polly ...	do	3,094.50	120.26	240	do do
Gwebi Mabel ...	do	5,872.00	193.38	240	do do
Elsie	do	7,352.00	236.41	210	do do
Gwebi Fairy ...	do	3,985.00	133.99	210	do do
Gwebi Allie ...	do	2,850.00	115.93	180	do do
Clara ...	do	4,463.50	148.31	140	do do
Gwebi Weather	do	3,979.00	135.71	150	do do
Gwebi Gypsy ...	do	3,028.00	114.71	150	do do
Gwebi Veda ...	do	3,715.50	113.43	150	do do
Gwebi Gay ...	do	4,501.50	155.24	150	do do
Gwebi Surprise	do	1,902.00	74.96	90	do do
Gwebi Flora ...	do	1,944.00	63.52	90	do do
Gladys ...	do	3,156.50	97.05	90	do do
Gwebi Antbloem	do	679.50	20.66	30	do do
Gwebi Beauty	do	1,895.00	65.96	60	do do
Palm Tree Allie	App. Friesland	1,785.50	49.48	60	do do
Gwebi Bourch	Grade Friesland	1,673.50	61.91	60	do do
Gwebi Fanny	do	872.00	32.53	30	do do
Gwebi Damsel...	do	723.00	21.54	30	do do
Gwebi Lassie ...	do	525.00	19.00	30	do do
Kleinbloem ...	do	756.00	21.92	30	do do
Gwebi Rosebloem	do	507.00	19.11	30	do do
Gwebi Lucy ...	do	808.50	28.78	30	do do

We regret that owing to lack of space the un-official milk records are kept over until next month.

Farming Calendar.

September.

BEE-KEEPING.

This is an important month for the bee-keeper, as it starts the first flow of the season. All hives that were sent into winter quarters on a double brood chamber, or otherwise with ample food for that period, should now be overflowing with young in all stages and with a population large enough to take full advantage of the flow. All hives should be carefully examined now and again, entrances opened out to suit the advancing warmth of the weather, and where necessary ventilator lids replaced on the top crates under the hive lid. See that no worry is caused to the bees by ants getting up, and that ample stores of good water (with a pinch of salt and a dash of vinegar) are available for drinking purposes, of which bees consume quite a lot. Swarms can now be looked for; if not required, they can best be destroyed by carbon bisulphide or calcium cyanide—both requiring very careful handling. If it is wanted to increase the apiary, as soon as the scouts are seen looking round for a home, get the decoy hive ready filled with dummy and proper frames of full foundation sheets, or, better still, if they are available, old drawn out brood combs, and as soon as it is taken possession of, insert if possible a frame or two of unsealed brood. As a rule the swarm will settle down at once. Such a colony is best placed in the apiary the same evening, if it can be so arranged. Do not make the mistake so often seen of supplying the new colony with starter frames only; give them full foundation sheets; it pays every time, and more especially so in the first early honey flow. Be sure also and protect the apiary against that persistent robber, the honey bear or ratel, by fencing it with fowl netting and pegging that down with wooden pegs every two feet. The two-footed robber can be just as effectively dealt with by placing a small light chain round the entire hive fastened with small staples and a padlock.

CITRUS FRUITS.

The fate of the citrus fruit crop is dependent upon the treatment the trees receive during this month. If the trees have been given the treatment recommended in the August calendar, and this treatment is followed by good irrigations and cultivation, a good crop of fruit can be expected, whereas a total failure may be the result if the trees suffer for want of moisture at this season of the year.

If not already done, all top worked trees should be headed back early in the month. This cutting back will induce the dormant buds (set in autumn) to commence growth. As the new shoots develop the old tops may be further shortened back until the old top is displaced with a new profitable one.

The packing of late varieties must be speeded up and completed by the end of the month if possible, as the late packed fruit is likely to deteriorate in quality or come into competition with Mediterranean fruits.

All adventitious shoots (water shoots and suckers) must be cut off as they appear, and this work should be continued throughout the growing season.

CROPS.

Utilise your labour to the fullest extent for stumping and clearing more land for mixed crops and for general farm development. Do not be satisfied unless each year sees more profit-earning development work effected. Good organisation of the farm work will permit of much being done without great cost. Begin marking out holes for hand check-row planting of maize, and apply manure or fertiliser. Fertilisers which are to be broadcasted and ploughed or harrowed in can be applied. Do not forget that lands which have been green manured in March or April will require a second ploughing about this date or before being seeded to crops. Early varieties of winter cereals ripen this month and require harvesting. Danger from frost should be past now, and crops susceptible to frost, such as potatoes, onions in beds for the summer crop and Jerusalem artichokes, may be planted where lands are moist. Pumpkins and early maize may be planted on vlei lands. Edible canna may be planted "dry" during the latter half of this month, where some rains may be expected during next month. Overhaul all implements and replace worn parts. Putting this off till the planting season may mean serious loss of planting opportunities between rains. Get out the planters and seed drills. Overhaul and place in proper working order. Ploughing and cross-ploughing should be hurried on with; also the ploughing under of farmyard manure. A spiked roller can usefully be employed for breaking down clods, particularly on those lands which are to be planted first. Make every effort to secure as good a seed-bed as possible; good seed-beds mean good stands, and good stands are all-important in securing good yields.

DAIRYING.

This is generally the quietest month of the year from a dairying standpoint. Most farmers have by this time exhausted their supplies of winter feed and the production of dairy products is consequently at its minimum. Town milk supplies are now falling off, and a greater use of purchased concentrates in the form of ground nut cake and bran is advisable to keep up the milk supply. Very little cheese is made during this month and stocks are naturally low. Old cheese should be cleared out of the storeroom before the advent of hot weather, and if possible should be sent to be stored under cold storage conditions. Considerable difficulty is to be expected in making butter during this month, as the early spring grass is shooting in the vleis and the butter is consequently very soft. To counteract this, greater use should be made of cotton seed cake, of which a small supply is expected to be available this season.

DECIDUOUS FRUITS.

Newly planted trees must not be permitted to become too dry; watering by hand or gravitation must be continued until the rains commence. Ten gallons of water every fourteen days are sufficient for young trees; these applications should be followed by the loosening of the soil to prevent undue evaporation of the added moisture.

All undesirable growths on the stem and in the centre of the trees should be suppressed as they appear; this will enable the retained shoots to develop normally.

Early fruits must be thinned out this month; only retain two or three fruits on each bearing twig or shoot. Those that are left will then develop into large and attractive fruits.

ENTOMOLOGICAL.

Cotton.—Prevention for most of the boll-worms will be the proper preparation of the ground, with thorough cultivation and eradication of all weeds on the land, particularly those of the family Hibiscus. Wild host plants for stainers should be sought out and destroyed.

Tobacco.—Young plants in seed-beds may suffer from cutworms. Frequent cultivation and laying down of poisoned bait—50 lbs. bran and

21 lbs. Paris green; bring to consistency of a stiff dough, adding water when necessary. Distribute this over the seed-beds in the forenoon, as the cutworm does most of its feeding at night. The beds should be thoroughly burnt over with wood or dry tobacco stalks to ensure that the seed-beds are free from cutworms, and baiting for any coming in from the surrounding ground should then be resorted to when the plants appear. Clear the ground for some distance round the beds, say 30 yards in all directions, and bait this ground thoroughly before sowing—this clearance allows a wide margin over which the cutworms would have to travel. Cutworms' moths are nocturnal in habit, so that the coverings of the beds need to be moth-proof at night; this should be seen to each evening.

Potato.—Early potatoes are liable to suffer from caterpillars. The crop should be sprayed at first sign of injury with an arsenical wash.

Cabbage.—During this month the most prominent enemies of plants of this family are diamond-back moth and web-worm. Cabbage louse is sometimes troublesome. The young plants may be sprayed or dusted with an arsenical compound for the former, and sprayed with tobacco wash and soap for the latter.

Beans.—Planted under irrigation during September usually escape serious infestation with stem maggot.

Citrus.—Throughout the month lime-sulphur spray (1-100) may be used to control yellow citrus thrip whilst on very young fruit. A useful spray against black aphis and thrip is the following:—Nicotine, 9 ozs.; Capex spreader, 7 ozs.; water, 100 gallons; Capex lime-sulphur, 1 gallon. This may be sprayed or fumigated against scale insects, having regard, however, to presence of fruit and blossom. Spraying and fumigating for scale should not be carried out whilst trees are in blossom. Clear young growth of aphis previous to blossoming, using nicotine, tobacco wash or Derris.

FLOWER GARDEN.

Cultivate extensively to prevent evaporation and to keep weeds in check. Water plants newly set out, especially such as have their roots near the surface. Thin and regulate growing shoots on roses and various shrubs. Plant out cannas and chrysanthemums (for massing and border decorations) and other herbaceous plants.

VEGETABLE GARDEN.

Sow French beans, leek, spinach, cucumber, egg plant, celery, rhubarb, melons and tomatoes. Small sowings of peas, turnips, beet, lettuce, radish, carrot, parsnip may be made now.

FORESTRY.

All cuttings struck in sand in July and not yet transplanted into good soil should have this done as soon as possible. Tentative sowings of eucalypt seeds should now be made on a small scale, so that transplants will be ready in case the first half of the rainy season should prove favourable; otherwise, bulk sowings should be postponed to October-November.

GENERAL.

Indigenous labour is apt to become more scarce at this time of the year, the boys returning to their kraals to break up the land for next season. Stock are liable to stray in search of the young grass now coming up, and much trouble from this cause is to be looked for on unfenced farms. Natives are now cultivating their gardens preparatory to sowing their crops, which they do much earlier than do Europeans. The mischief caused by veld burning becomes apparent from this time onwards in the condition of the stock, and it is necessary frequently to move them away in search of grazing.

POULTRY.

The supply of green food to the birds must be kept up; in fact, during the hot weather they require more.

During our dry season the available supply of such green foods as lettuces, cabbages, sunflower leaves is much reduced, but there are many others that can be used, such as belhambra, plumbago, wild cockscomb, plantain leaves, paw-paw leaves, etc. Sprouted oats, barley and wheat should also be used. Many of the young cockerels should now be fit for killing. Keep the best and get rid of the remainder. It is very advisable to caponise all young cockerels when about 2½ lbs. weight. The "Rhodesia Agricultural Journal" of October, 1924, and Bulletin No. 517 give clear and concise details as to the method of performing the operation. Some of the earliest hatched young pullets will show signs of commencing to lay now. No light breed bird should lay until it is 5 to 5½ months old, or a heavy breed until it is 6 to 6½ months old. Should any show signs of commencing to lay before this, they should be moved from run to run to prevent their doing so. A bird that lays before it is fully matured will stop growing, will always be small, and its eggs will for its first year of laying also be small.

When the pullets are four months old, i.e., those of the light breeds, they should be put into their permanent laying quarters, and those of the heavy breeds when they are five months old. A bird that is moved after it has started to lay will stop and very probably go into a moult.

See that young ducklings get plenty of shade during the hot weather. Those destined for killing should not be allowed free range or even a medium-sized run, but should be kept fairly crowded in small runs. It is necessary to get the flesh on them as quickly as possible, and the more rest and less exercise they have, the more rapid will be the growth, and also more succulent and tender the flesh.

The hatching of turkeys should proceed rapidly and be carried on until the end of the dry season. See that they have plenty of chopped onions or onion tops or eschalots, and thick separated milk. These are absolutely necessary if the turkey breeder wishes to be successful with his rearing. Do not give wet food; dry mash such as given to chickens is the better.

STOCK.

Cattle.—Ranching cattle should require little now in a normal season; it is only in the event of very late rains that trouble should be expected. Where possible, it will be wise to keep an eye on those cows that may be expected to calve early, with a view to feeding them if necessary, and seeing that they do not get too poor. The dairyman will carry on much as in August; he will, however, use his discretion (in accordance with the condition of his veld) as to the use of ensilage, pumpkins or other bulky and succulent food. He will be wise not to shorten the supply of concentrated foods for some time to come. A little hay or ensilage should still be kept in reserve until the rains have fallen in reasonable abundance.

Sheep.—The remarks for August apply. If spring lambs are expected, it will be wise to see that the sheep shed is in good order—clean, dry, properly drained and airy. Watch that the ewes shall not be poor when they lamb, and remember that they cannot rear good lambs if the veld is bad, but must have their grazing supplemented, just as milk cows are fed in order to produce milk.

TOBACCO.

Hasten preparation of seed beds. Begin sowing seed beds each fortnight for the acreage proposed to be planted; fertilise and stimulate growth so as to be ready for planting out should rain come early in November.

VETERINARY.

There should be very few deaths from redwater and gallsickness this month. Cases of vegetable poisoning of stock picking up tempting young green shoots of dangerous character on the burnt veld are of frequent occurrence. Sheep can be inoculated against blue tongue, but ewes in lamb should not be treated, on account of the danger of abortion. Scab may be prevalent.

WEATHER.

The temperature may be expected to rise steadily during this month. Rains are not due until next month, though the average over a period of years shows slightly more than in the previous four months, and ranges between .1 and .5 inch. Frost has been known to occur in September, although this is a very unusual event. Rain-gauges should be seen to before the rains commence. They should be carefully adjusted to stand exactly level with the lip four feet above ground, and care should be taken that no tree, building or other obstruction interferes with the fair precipitation of rain into the orifice.

October.

BEE-KEEPING.

Bush bloom is now on, the queens consequently are laying vigorously, therefore give space and ventilation. In good districts, where stocks are strong, nectar may be coming in freely, and to prevent swarming it may be necessary to remove a crate of honey. By using the carbolic cloth, the operation is easily and quickly accomplished. At this season, whenever a crate of honey is removed, a properly fitted empty crate must take its place, otherwise the bees will swarm. Keep the apiary clear of weeds, and all hives well shaded. Feed any weak stocks.

CITRUS FRUITS.

Citrus trees should not be permitted to suffer for want of water if a good setting of fruit is desired. Continue irrigation at fairly frequent intervals, especially if it is windy. Cultivation must follow each irrigation when the soil is fit to work, otherwise a large amount of moisture will be lost by evaporation. The packing of late fruit for export should be completed early in the month or before the rains commence. If rains intervene, the carrying properties will be affected and the fruit will probably break down in transit. Suppress all stem growths or water shoots as they appear. Young trees planted last season may with advantage have the stems whitewashed or washed with Bordeaux mixture paste; this will prevent undue sun-scalding of the unprotected stems. Plant cover crops with the first good rains.

CROPS.

If not already attended to, overhaul all farming implements and replace worn parts to ensure efficiency. Shell ground nuts required for the season's planting. Ploughing of old lands should, at latest, be finished this month. If seed potatoes will not keep in good condition until next month, they may be planted now, but later planting is better. Edible canna may be planted this month before rain falls. Also velvet beans, dolichos beans and sunn hemp towards the end of the month for green manuring. Harvest winter cereals and plough under the stubbles as soon as possible after harvest. When rains have fallen, use every effort to improve the tilth of the lands which will be the first to be planted. On cloddy lands already ploughed, seize the opportunity to break down the clods by disc and drag harrowing as showers of rain fall. A spiked roller is very useful for this work. A good tilth means good planting, and a good stand of maize; therefore, do everything possible by cross ploughing, disc and drag harrowing to bring the soil into good condition for seeding.

When necessary, keep the harrows going to check early weed growth. Clean lands at this time of year are an insurance against cutworm and other insect pests. If weather conditions permit, plant a trap crop of

maize to attract the stalk borer. New land to be ploughed and intended for planting this season should be cleared of heavy grass or weeds by burning or cutting to ensure good work being done by the ploughs. Seasonal showers of rain are liable to spoil bricks unburned. See that bricks which have been made are protected from rain. Clean out guttering and down-spouts of house and farm buildings. Press on with development work so as to have this completed before rains break.

DAIRYING.

During the month of October and until such time as the rains have commenced and green grazing is available, dairy stock require to be almost entirely stall fed. Cows in milk and cows due to calve should be liberally fed on succulents and concentrates in order that they may commence the dairying season in good condition, and make full use of the early grazing for milk production. Dairy cows that are underfed at this time of the year invariably produce milk of poor quality, and usually throw weedy undersized calves; furthermore, they do not pick up in condition until comparatively late in the season.

During October, the cow's ration should consist of succulents such as silage or green feed, etc., legume hay of good quality and a liberal allowance of concentrates; a pound or so of a feed such as ground-nut cake is invaluable for dairy stock at this time of the year.

Weather conditions are generally fairly warm during the month of October, and every precaution should be taken to keep the cream, which is used for butter-making or which is sent to the creamery, as cool as possible. The can or bucket containing the cream should be placed in a basin of water or concrete trough, in the dairy, and exposed to a draught; a piece of kaffir blanket, which dips into the water, should be wrapped around the can or bucket containing the cream. Churning of cream for butter-making is best carried out early in the morning—before sunrise if possible; the coolest water obtainable should be used for washing the butter whilst in the granular stage.

At this season of the year cheese-makers may find that the milk is deficient in butter fat; this is generally the result of under-feeding or unsuitable feeding. Cheese made from milk of low fat content is invariably dry and hard, defects that are accentuated by over cooking the curd or by cooking at too high a temperature. The curd should be firmed in the whey at a temperature not higher than 98° F. to 100° F.

DECIDUOUS FRUITS.

Keep all trees well watered until the rains commence; cultivate after each watering to prevent evaporation of added moisture. Rub off all undesirable shoots, such as those arising on the main stem near the ground; also those shoots having a tendency to crowd each other. Two or more shoots should not be allowed to develop from the same spot on any part of the tree. Rub off the undesirable ones soon after they appear. The fruit of early peach trees should be thinned out if a heavy crop has set; this thinning will result in a crop of large-sized fruit. All fruit should be thinned out if necessary.

ENTOMOLOGICAL.

Maize.—Where circumstances permit early growth of maize, crops planted late in October are liable to suffer in December from stalk-borer, especially if only a few acres are involved. If maize can be planted early in October, the plants are usually large enough by December to outgrow serious damage. Maize beetle is now in its pupal stage. Thorough working and smashing up of the soil at this time will destroy great numbers.

Tobacco.—See notes for last month, together with article in the "Rhodesia Agricultural Journal" for October, 1926, on "Baiting of Tobacco Seed Beds with Cyanogas Calcium Cyanide." The lands must be kept free from all weeds which caterpillars may feed on, and it is well not to have maize lands, tomato and Cape gooseberries near the lands; a

clearing of some depth is advisable, which must be regularly weeded. If poisoned bait is put down, it has been found that a covering of sacking or leaves will help to retain moisture and thus give further attraction, especially at this time of the year. In order to lessen the heavy infestation of caterpillars and other insect pests in the seed beds, coverings of hessian or cheese cloth should be kept over beds, especially at night; cutworm moths are nocturnal in habit, so that the coverings of the beds need to be moth-proof at night. Notwithstanding precautions in the covering of the beds, insects will enter, and after the emergence of the seedlings a weekly spraying should be carried out. Lead arsenate at the rate of 1½ ozs. (powder) or 3 ozs. (paste) in a 4-gallon petrol tin can be sprayed on the plants once a week to keep insect pests in check. Lead arsenate can be safely used with Bordeaux mixture, the mixture not reacting upon one another. The two combined sprays act as a preventative and deterrent to insect and fungoid troubles.

Cotton.—Thorough cultivation and keeping down of weeds should be resorted to in order to lessen the infestation of over-wintering pupæ, by exposure to the sun, and birds.

Potato.—Avoid introducing root gallworm and potato diseases to valuable land under irrigation or to the home garden with seed potatoes. Growing plants in October may be defoliated by caterpillars, or the tops severely injured by the potato tuber moth. Spray with arsenate of lead (powder), 1 lb. to 30 gallons of water; or (paste), 1 lb. to 16 gallons of water.

Cabbage, Turnip, etc., are apt to suffer severely from diamond back moth and webworm. Dust regularly with Paris green, 1 lb.; fresh water-slaked lime, 20 lbs. For cabbage aphis, water liberally, and wash plants regularly with a forceful stream of water from a hose or spray pump.

Beans and Peas are little attacked by insects at this time of year. If aphis (green fly) is troublesome, the plants may be sprayed with soap wash or tobacco wash. Leaf-eating beetles are best destroyed by hand.

Cucumbers, Marrows, etc., may be attacked by leaf-eating beetles, which quickly destroy the young plants. The young plants may be protected by gauze covers. Once vigorous growth has started, the damage is negligible.

Citrus.—All out-of-season fruit should be removed by this time. Destroy all fruit "struck" by the false codling moth. Aphis may be controlled by very careful spraying with the combined "Lime-Sulphur-Nicotine" spray (for details see "Rhodesia Agricultural Journal," Sept., 1926, page 871), while the yellow thrip may also be kept in check by this spray. Avoid using miscible oils for citrus spraying. A careful search should be made for the American bollworm ("Heliothis obsoleta"), and the Chief Entomologist should be immediately informed should this pest be found.

Deciduous Fruit Trees, including grape vines, are liable to attack by chafer beetles. Heavy spraying with lead arsenate (paste), 1 lb. to 10 gallons of water, or (powder), 1 lb. to 20 gallons, appears to afford considerable protection, but the leaves need thoroughly coating.

Fig.—Fruit infested with fig weevil should be collected regularly and destroyed.

FLOWER GARDEN.

All flower seeds, annual and perennial, may be sown as in September. A word or two on open seed beds may not be out of place here. These beds should be prepared in a sheltered position, and the soil should be well and deeply dug. This is most essential, as in this state the soil when once watered is more easily kept moist, and is not so liable to cake. The top dressing should be free from all undecayed vegetable matter, and when sown, the seeds should be covered with a thin dressing of fine light soil, over which a thin covering of grass may be placed to check evaporation. Transplanting from boxes or beds should be done on a dull

day or towards evening; the plants should be well watered before being removed, and the roots disturbed as little as possible, care being taken that the latter have their full depth and spread when planting.

VEGETABLE GARDEN.

As in September, nearly all vegetable seeds may be sown. Early potatoes should be earthed up when reaching the height of about eight inches. In planting a small amount of marrow, melon, cucumber, and pumpkin, the writer has found it economical to sow the seed one in a tin and transplant when about four inches high in hills. A few cucumbers planted in this manner yielded nearly 400 a week for about two months. Sweet corn and maize may also be sown this month.

FORESTRY.

The main sowings of Eucalypt (gum) seed should be made either in seed trays or in well prepared seed beds. A well-broken soil forming a fine tilth in the seed bed ensures more successful germination and better plants. If transplants are being used, any seedlings which are ready should be pricked out.

Seedlings in open beds may have their tap roots cut so as to develop fibrous lateral roots, and thus produce good type stocky plants. Remember the plant feeds through its roots, hence the better the root system, the healthier the plant and the greater its chances of successful establishment. If conditions are favourable, cross-plough and harrow land for planting broken up in early autumn.

POULTRY.

October is usually a hot month, and poultry keepers should therefore see that their birds have access to shade during the day. At the same time they should have plenty of air. One often sees birds during hot weather sitting under dense bushes, which is almost worse than no shade at all.

All houses should be examined and, if necessary, repaired. It is advisable to repeat the caution that birds must have dry quarters.

Many poultry keepers do not realise the vital necessity of giving their birds especially the young stock, plenty of succulent green food during the hot weather. It should be cut up and placed in boxes or hoppers about 7.30 a.m. and 5 p.m., and, if very hot, also at noon; it should never be placed in the sun. As much as the birds will eat should be supplied. Lack of it, especially during hot weather, causes a reduced output of eggs, smaller eggs and light-coloured yolks; further, a disease known as "nutritional disease" is likely to affect the birds and cause deaths. The symptoms are much like those of eye roup, without the well-known offensive smell of roup. It is due to the fact that vitamine A, which is present in large amounts in all succulent green foods, and which is so necessary for nutrition, is lacking. There is no doubt that many chickens and fowls die each year from this cause.

Ducks.—These during the hot weather require even more shade than do fowls; they cannot stand the direct rays of the sun nor sultry heat. The houses should always have dry floors, and should be overhauled before the rains commence. Ducks sleeping on damp floors often contract rheumatism and cramp. The floor of the duck house should be raised a few inches, thus ensuring a dry bed.

As many ducklings should be hatched as possible now, provided, of course, there is the prospect of a sale for them at ten weeks old. They thrive best in the wet weather.

Turkeys.—Stop hatching until after the wet season is over. To rear turkeys in the wet weather entails a good deal of time, labour, expense and often losses. Once a young turkey chick gets wet, it will probably die; at any rate it will never be the same bird it would have been had it not got wet. Give the older turkeys all the range possible; the further

afield they go, the better grown birds they become, and less is the expense of feeding. See also that their roosting quarters are water-tight before the rains commence.

STOCK.

Cattle.—Ranching cattle on granite veld will in many instances be in fairly good condition on account of the early grass in the vleis, etc. On the diorite soils and later veld the cattle owner will still have to watch his weaker cattle carefully. In any case all supplies of hay, ensilage, majordas, etc., should be carefully husbanded in anticipation of possible late rains, but at the same time every effort should be made to prevent cattle becoming weak. Dairymen will need to feed highly both with succulents and green foods. Calves should be weaned and branded, if this has not already been done, and care should be taken that they do not suffer any serious set-back by reason of the want of veld. If calves are not desired in mid-winter, the bulls should be taken out of the herd now until the end of January. Care should be taken to provide a plentiful supply of clean water, and dipping must be regularly attended to.

Sheep.—If spring lambs are expected, one should see that the sheep shed is in order, and that there is a supply of hay, ensilage or mealies for the poorer ewes in the case of late rains. All drinking places should be cleaned out, and care taken that the water supply is sufficient.

TOBACCO.

Continue to sow seed beds. Where grass has been put on the seed beds to assist germination of seed a daily inspection should be made, and as soon as the first few plants make their appearance the grass should be raised up a little from the bed in order to prevent the plants growing "spindley." All possible preparation for the coming planting season should be made.

VETERINARY.

White scour is prevalent in spring—November and December—but dipping is eradicating this disease. There is still danger from vegetable poisoning, and it will only disappear when there is plenty of good grass on the veld.

WEATHER.

This is apt to be a hot, dry month, and rather trying, therefore, to man and beast, and the strong winds which blow at this season add to the general discomfort. Evaporation is, as a consequence, at its greatest at this time of year, and dams and pools lose most from this cause. The prevalence of veld fires at this time of year adds to the anxiety of the stock owner.

The rainy season has occasionally started early in October, but for practical purposes it need not be expected before the end of this month. The days are becoming warmer, and often even hot and oppressive. Clouds gradually collect, at first disappearing at sunset, but later becoming more persistent. Sheet lightning is usually frequent, and showers of gradually increasing severity mark that the rainy season has set in. Steps should be taken in advance to provide for the run-off after such torrential rains, otherwise serious loss may result.

The normal rainfall varies from three-quarters of an inch to an inch in the different portions of the country. The rain usually occurs in the form of thunder-showers, which are not long sustained and are fairly local, but the total rainfall experienced during the month does not vary much over the whole country, with the exception of the eastern border, where the rainfall is usually heavier.

Notes from the "Gazette."

"*Gazette*" *Date.*	*Items.*
	AFRICAN COAST FEVER.
	Melsetter Native District.
8.8.30.	Government Notice No. 496 releases the following farms from all restrictions: Morgenson, Avontuur, Canterbury, Groenvlei, Woodlands, Mooiplaats, Nooitgedacht, Vermont, Wolverhampton, Helvetia, Ravenswood, Kenilworth, and all sub-divisions thereof, and Chipinga commonage.
	Mazoe Native District.
1.8.30.	Government Notice No. 476 releases the following farms in the native district of Mazoe from all quarantine restrictions: Sussex, Umzi, Glendale Station, Glen Grey, Limbeck, Farm No. 26, Sweet Valley, Banff, Tekke, Skye, Arda and Hasfa.
	"TSETSE FLY ACT, 1929."
25.7.30.	The following area in the Lomagundi district is defined as a tsetse fly area in terms of section 1 of the above act:— An area in the south-west portion of the Lomagundi district bounded by a line drawn from the junction of the Piriwiri and Sanyati Rivers, up the Piriwiri River to the boundary of Kanyaga Farm; thence southward following the Government game fence to the Sisuje River; thence down the Sisuje River to its junction with the Umfuli River; thence down the Umfuli River to its junction with the Sanyati River; thence down the Sanyati River to the starting point. To be known as the Lomagundi South-West Tsetse Fly Area. (G.N. No. 16.)
	"TSETSE FLY ACT, 1929."
25.7.30.	The following regulations apply until further notice:— 1. For the purpose of these regulations "game fence" means a fence erected by the Government to control the movements of game; "vehicle" includes motor cars, motor lorries, motor cycles and cycles. 2. No person shall take any ox, bull, cow, heifer, horse, mule or donkey into a fly area. 3. No vehicle shall leave the Lomagundi south-west fly area, as defined by Proclamation No. 16 of 1930, except by the road known as the Sinoia-Copper Queen Road passing through the game fence on the western boundary of Kanyaga Farm, near Zumba Hill. 4. No vehicle shall leave the said fly area until such vehicle and any driver, rider and passengers have been inspected and cleared of any tsetse flies by the guard at the gate in the game fence across the Copper Queen Road. 5. Any person contravening these regulations shall, on conviction, be liable to a fine not exceeding £10 (ten pounds), or, in default of payment, to imprisonment for a period not exceeding one month. 6. Nothing in these regulations shall apply to animals which for experimental or other purposes may, with the authority of the Minister of Agriculture and Lands, be moved into the fly area. (G.N. No. 469.)

Departmental Bulletins.

The following Bulletins, consisting of reprints of articles which have appeared in this Journal, are available for distribution free of charge to applicants in Southern Rhodesia only. Outside Southern Rhodesia, 3d. per copy.

AGRICULTURE AND CROPS.

No. 174. Notes on Hop Growing, by H. G. Mundy, F.L.S.
No. 225. Napier Fodder or Elephant Grass, by J. A. T. Walters, B.A.
No. 278. New Crops for Rhodesia, by J. A. T. Walters, B.A.
No. 362. The Cultivation of Rice, by H. G. Mundy, F.L.S.
No. 403. Florida Beggar Weed, by H. G. Mundy, F.L.S.
No. 429. Propagation of Kudzu Vine, by H. C. Arnold.
No. 442. Swamp or Irrigation Rice, by K. V. Yoshi, Bombay.
No. 510. Check-row Planting of Maize, by H. G. Mundy, F.L.S.
No. 513. The Carob Bean in Rhodesia, by J. A. T. Walters, B.A.
No. 541. The Potato Crop under Irrigation, by G. R. Syfret.
No. 545. Artificial or Synthetic Farmyard Manure, by H. G. Mundy, Dip.Agric., F.L.S.
No. 550. Onion Growing under Irrigation, by C. Mainwaring.
No. 561. Wheat Growing in Rhodesia, by C. Mainwaring.
No. 568. The Treatment of Arable Land, by G. N. Blackshaw, O.B.E, B.Sc., F.I.C.
No. 581. Leguminous Crops for Stock and Soil Improvement in Southern Rhodesia, by C. Mainwaring, Agriculturist.
No. 590. Rye, by H. W. Hilliard, Junior Agriculturist.
No. 591. Maize Export Conference Proceedings.
No. 598. Drought-resistant and Early-maturing Crops for Areas of Late Rainfall, by C. Mainwaring.
No. 599. Rhodesian Soils and their Treatment, by E. V. Flack.
No. 601. Maize for Export, by S. D. Timson.
No. 603. The Production of Maize in Southern Rhodesia, by C. Mainwaring, Agriculturist.
No. 630. The Storage of Seed Potatoes, by H. C. Arnold.
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No. 532. The Short Period Forecast and Daily Weather Report, by C. L. Robertson, B.Sc., A.M.I.C.E.
No. 542. Review of the Abnormal Rainfall Season 1924-25, by C. L. Robertson, B.Sc., A.M.I.C.E.
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Summary of the Game Laws of Southern Rhodesia

Mr. C. C. Macarthur's fat bullocks, champions at Salisbury and Bulawayo Shows, 1930.

THE RHODESIA

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Vol. XXVII] October, 1930. [No. 10

Editorial.

Contributions and correspondence regarding subjects affecting the farming industry of Southern Rhodesia are invited. All communications regarding these matters and advertisements should be addressed to:—The Editor, Department of Agriculture, Salisbury.

Fat Stock.—For the past few years the slaughter classes of the cattle section have been a feature of the Salisbury Show, and great store is placed on the awards of the judges. Entries have increased annually, until this year no less than 400 animals were penned. It is not to be expected that the standard of quality was uniformly high, but there is evidence of a better realisation of butchers' requirements, and a decided advance has to be recorded in this respect. A very special effort indeed is needed to attain championship honours, and the competition engendered is all to the good of the cattle industry. This year Mr. C. C. Macarthur added to a long list of successes by annexing premier honours in the slaughter classes with grade Shorthorns bred and fed on his farm Komani, near Salisbury. The same animals were shown at Bulawayo, where the competition was also very

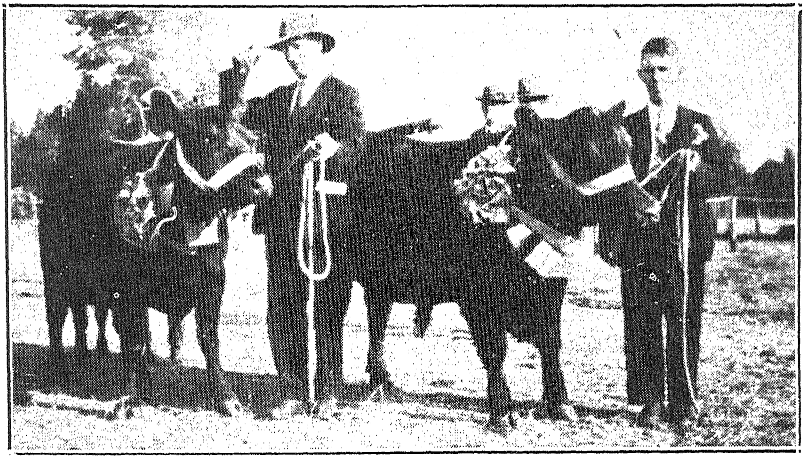
keen, and here he succeeded in repeating the Salisbury results. His ox which was awarded the championship at Salisbury and Bulawayo was shown at the Johannesburg Spring Show, held on the 9th and 10th September, and here, in keen competition, he won the full mouth single ox open class, as well as the Shorthorn Society's special prize for the best Shorthorn on the show. At the subsequent sale of fat cattle this animal realised £28.

Mr. Macarthur's exhibit of fat stock was an outstanding one, and an example of what can be achieved by the use of good bulls, judicious selection, proper feeding and close attention to essential details of animal husbandry. The photographs which we reproduce herewith show animals of a type fit for any market, and give an indication of what the Colony is capable of in the raising of high-class cattle under ordinary farm conditions. Given the necessary incentive in the way of paying markets, it is no exaggeration to state that animals of the type illustrated could be produced in large numbers.

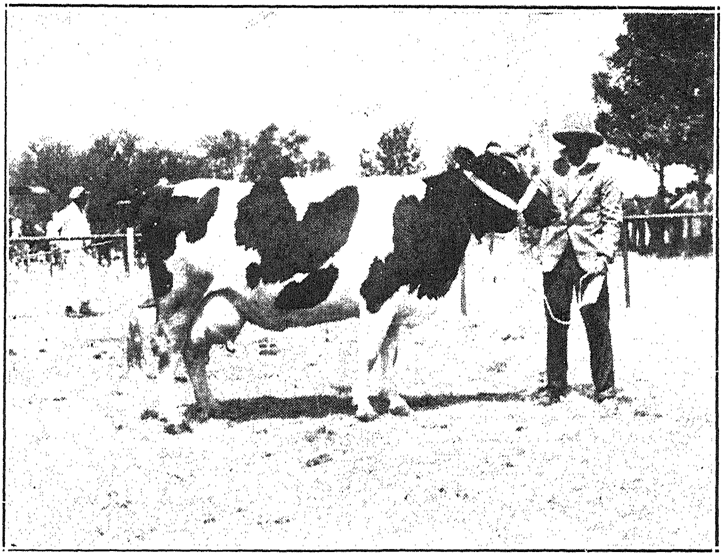
Milking Competition—Bulawayo Show.—The first prize in the milking competition at the recent Bulawayo Show was won by De Grendel Hansy—a seven-year-old Friesland cow. In this competition Hansy obtained for milk and butter production, etc., a total of 147.1 points, and produced in three milkings 78.2 lbs. of milk (nearly 8 gallons of milk in 24 hours), with an average test of 3.4 per cent. butter fat. On this very creditable performance Hansy qualifies as one of the highest producing cows in this Colony.

De Grendel Hansy's previous performances are also of interest. Her official record for her previous lactation is 15,193.00 lbs. of milk, containing 475.87 lbs. of butter fat, produced in 300 days; this is an average of over 5 gallons of milk per day for 10 months—a very fine performance.

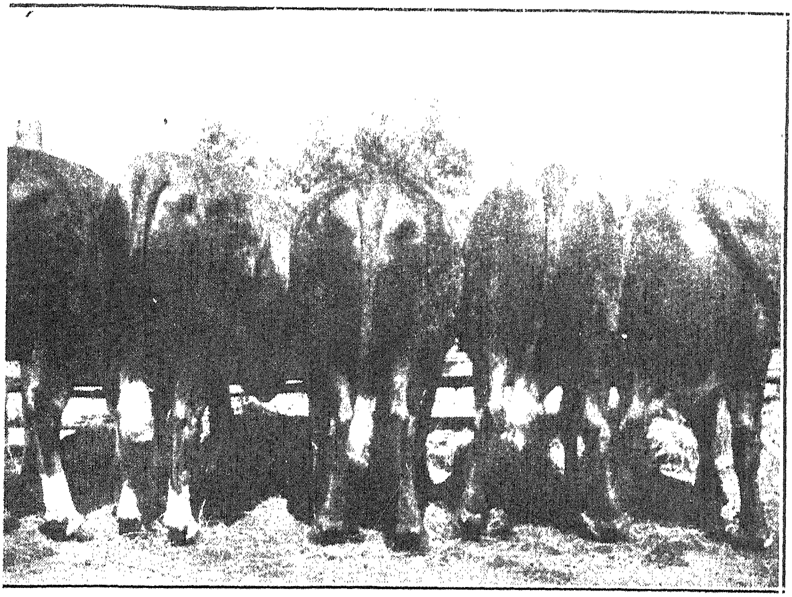
The second prize was also awarded to a Friesland, Vermaakskraal Matje—a six-year-old cow. This cow, milking in three quarters only, received 105.1 points, and produced over 5 gallons of milk in 24 hours, with an average test of 3.1 per cent. butter fat.



Champions at Salisbury Show, 1930, all breeds.
Aberdeen Angus bull Brisling, born 30th December, 1928, bred by Mr. R. W. Walker, Scotland, and imported by Mr. Duncan Black.
Aberdeen Angus cow Lucy 1st of Selby, born 28th July, 1924, bred and shown by Mr. Duncan Black.



Do Grendel Hansy, born 23rd September, 1923, winner of milking competition, Bulawayo Shows, 1929 and 1930. Owned by Mr. G. A. Lyons.



Mr. A. L. Millar's fat stock, second at Salisbury and Bulawayo Shows, 1930.

Mr. Duncan Black's Aberdeen Angus bullocks, third at Salisbury Show, 1930.

Both of these cows are the property of Mr. G. A. Lyons, a dairy farmer and breeder of Frieslands in the Bulawayo district. This is the second occasion on which these two cows have received first and second prizes in the milking competition, open to all breeds. These cows won first and second prizes in 1929.

Three Shorthorn cows competed for third place in this competition. Of these, Oakleigh Violet II. put up a very useful performance, producing 4 gallons of milk, with an average test of 5 per cent. butter fat.

Lowering Cost of Production.—"On the definite knowledge that the farmer himself is powerless to control the destiny of his product once it leaves his own farm, it would appear that the lowering of its cost while under his control is his one and only salvation to-day. Thus the reiterated advice of to-day—reduce costs—is simple in statement, more involved when contemplated, difficult when applied. Unfortunately costs cannot be reduced overnight. Had we all followed the methods approved and extolled for the past 40 years, we would now likely be producing at nearly minimum costs. From this time on, whether it is easy or difficult, whether we want to do it or object, it would appear that either we produce at lower costs or we find some better way of making a living."

The above is extracted from "Seasonable Hints," issued by the Dominion Experimental Farms of Canada, and contains so much elemental truth that we make no apology for bringing it to the notice of our readers. We in this Colony, in common with the rest of the world, are suffering from the effects of a severe slump in prices for farm products, and it is impossible to see how long this condition of affairs will obtain. The lowering of the cost of production appears to be the only way of circumventing the economic trend, and the most obvious line of attack is to increase acreage yields, which, with all our main crops, are still decidedly low. As an example of what can be done, we refer to the article in this issue of the Journal describing the effects of green manuring on a farm in the Umtali district, where yields of

27½, 29 and 31 bags of maize were obtained. Likewise with our cattle industry. How often do we hear of an annual calf crop of less than 50 per cent.! There is something radically wrong with a system which does not show a better return than this. Whether it be maize, tobacco, cotton, ranching or dairying, we must admit that as a general rule production in this Colony is less than it should be, and the present is undoubtedly the time to take stock of the position to see where improvement can take place, for unless we can produce more economically, we shall find ourselves left in the struggle for existence.

Export of Graded Ground Nuts.—We are informed by the Farmers' Co-operative Society, Ltd., Salisbury, that after careful consideration of the matter and enquiry, they have come to the conclusion that the best packing for selected hand-picked ground nuts shipped overseas is the ordinary 2½ lb. A twill gunny sack, as used in the export of maize, though, provided no patched bags are used and the sacks are in sound and suitable condition, there would be no objection to the use of second-hand bags of this kind.

The Farmers' Co-op., Ltd., intends to adopt this style of packing in future, since it obviates the need to purchase special bags for the export of nuts and also ensures adherence to the standard Rhodesian weight of 75 lbs. per bag of nuts.

It is recommended that in future all Rhodesian exporters of selected hand-picked nuts should utilise this type of bag and sell to the standard weight of 75 lbs., since by this means the Rhodesian article will become known at a recognised weight and in a uniform type of receptacle.

Cotton in Matabeleland.—We reproduce on the opposite page two photographs of the cotton crop grown on Messrs. Bickle Bros.' farm Amanzana, Umgusa Valley. The area is 24 acres and the variety is U 4, which was planted by hand on the 22nd and 23rd November. Fourteen natives were employed on this operation, which Messrs. Bickle Bros. consider is a much more satisfactory method than using a

Twenty-four acres of U. 4 cotton at Messrs. Bickle Bros.' farm Amanzana, Umgusa Valley, Matabeleland, yielding 1,000 lbs. of seed cotton per acre.

A typical U. 4 cotton plant on Messrs. Bickle Bros.' farm.

planter and quite as quick. They find that far less seed is required if the crop is hand-planted, and point to the added benefit of having the plants check-rowed. The rainfall was 25.35 inches, of which 4.35 inches fell before the cotton was planted.

No fertiliser was used for this crop, but the land was planted the previous year to maize, which received 150 lbs. of maize fertiliser. The soil is described as chocolate sandy loam. The first picking was taken on the 23rd May, just six months from the date of planting. The early frosts were quite severe, but they did no damage, and by the time really hard frosts came, the crop was fully matured.

The actual weight of seed cotton reaped is given as 24,800 lbs., or 1,000 lbs. to the acre. It is of interest to note that Messrs. Bickle Bros. give their production cost up to the time of reaping at 10s. per acre.

We might here interpolate that, gratifying as it is to record the excellent crop reaped on Messrs. Bickle Bros.' farm, this result must not be taken as typical of plantings throughout the Colony. Bollworm took a heavy toll on many farms, and it constitutes a menace which must be taken into account when the cropping programme is planned. We believe that measures will be devised to circumvent the bollworm, but in the meanwhile the policy should be one of caution. In any case, we believe that the surest basis on which successful cotton growing can be developed in this Colony is as an integral part of a general scheme of mixed farming.

Live Stock Statistics.—The total number of cattle owned by Europeans in Southern Rhodesia at 31st December, 1929, was 902,163, as compared with 905,383 at the end of 1928. The totals for the previous three years were 956,522 in 1927, 991,216 in 1926 and 1,006,086 in 1925. The cattle population (European owned) reached its zenith in 1925, material increases being recorded for the four years succeeding 1917, when the total was 551,632. The percentage increases were 13.6 in 1917, 12.8 in 1918, 13.0 in 1919, 13.9 in 1920 and 17.1 in 1921. The figure dropped to 3.4 in 1922,

rose to 6.1 in 1923, and dropped to 1.0 in 1924 and 0.02 in 1925, since when decreases have been recorded each year.

In the totals for 1929, which were printed in the "Economical and Statistical Bulletin" of 21st August, it will be seen that the greatest reduction occurs in the number of oxen, trained, untrained and yearling, which number 327,542, as compared with 340,401 in 1928. An increase is recorded in the number of calves under one year, the figures being 148,192 in 1929 and 133,564 in 1928, which would appear to indicate that the shrinkage in the number of European-owned cattle will shortly come to an end. It is worthy of note that the number of pure-bred cattle has shown a steady increase during the past five years and now totals 14,844.

Sheep show an increase, the number of merinos totalling 14,579, as compared with 10,760 in 1928, while "other sheep" numbered 70,980 in 1929 and 68,909 in 1928. The pig population has fluctuated during the past five years, but an increase is recorded in 1929, the total being 23,490, as compared with 21,102 in the previous year. The number of horses in the Colony is 2,403 only. Poultry shows a big increase, numbering 242,356 in 1929, as compared with 189,223 in 1928.

The following farm products were sold during 1929: 512,693 dozen of eggs, 1,041,809 gallons of milk, 323,316 lbs. of butter, 233,262 gallons of cream, 122,738 lbs. of cheese, 37,967 lbs. of bacon and hams and 48,731 lbs. of wool.

Factories in the Colony produced 1,124,220 lbs. of butter, 451,717 lbs. of bacon and hams and 228,949 lbs. of lard and sausages in 1929.

The Tobacco Industry of America.—"Tobacco," the American Weekly Trade Journal, which is remarkably well informed on all matters pertaining to the tobacco growing industry in the various producing countries of the world, including Southern Rhodesia, has issued a special export number, from which we have extracted information likely to be of interest to our readers. The figures also serve to demonstrate the gigantic dimensions of the tobacco growing industry of the United States.

The production of tobacco in the United States in 1929 amounted to 1,500,891,000 lbs. and the consumption to 794,943,000 lbs. Exports in that year totalled 572,216,000 lbs., and imports, consisting mainly of cigarette and cigar tobaccos, to 98,523,000 lbs. Stocks on hand on the 1st January, 1929, amounted to 1,755,408,000 lbs. The average production for the period 1920-24 was 1,333,042,000 lbs., and from 1925 to 1929, 1,352,373,000 lbs. Consumption averaged 684,741,000 lbs. during the years 1920-24, and from 1925 to 1929, 766,284,000 lbs. Exports rose from an average of 513,324,000 lbs. during the years 1920-24 to 530,981,000 lbs. in the period 1925-29. The average annual exports of bright flue tobacco in the years 1923-24 were 222,749,000 lbs., which increased to 289,346,000 lbs. during the 1925-27 period. Comparing this average with that of 1928-29, the increase was 132,573,000 lbs., or 45.8 per cent. The price trend, however, was decidedly downward. The increase in 1928 and 1929 occurred chiefly in exports to China, but leaving this country out of the picture, there was an increase of approximately 18,000,000 lbs. in 1928 over 1927, and 35,000,000 lbs. in 1929 over 1928. During the period 1923 to 1929 exports of bright flue-cured tobacco to Great Britain more than doubled, being 115.6 per cent. During this period nearly 47 per cent. of all exports of these tobaccos were to the British Isles.

The writer of the article from which we quote states that in some circles it is believed the exports of tobacco from the United States have reached the saturation point, but in others this belief is not shared. Exports of bright flue-cured tobaccos during the first five months of 1930 are 15 per cent. above those of the same period of 1929 and are on a par with those of the like period of 1928.

In another part of the same issue of "Tobacco" are given costs of producing tobacco in North Carolina, taken from the actual figures reported by a large number of farmers. These are not intended to represent average cost, but rather the distribution of cost items in relation to their total value for different years. The total cost of production per acre in 1929 was 108.52 dollars and the value of the

product 133.80 dollars, leaving a profit of 25.28 dollars. The cost of producing a pound of tobacco was .14 of a dollar and the selling price .17 of a dollar.

Rhodesian Ridgebacks.—The rapidly increasing interest in this breed of dogs for farm and veld indicates that experience is proving them highly suitable for the conditions obtaining in this Colony. To those who have owned them, this is an unnecessary statement—they have proved it for themselves—but the majority of those who spend their lives principally in the remoter parts of our Colony probably only know the Ridgeback as a peculiar breed of dog which one may see more or less prominently at the local show. To that section of the community an unvarnished description of the breed and its virtues may be of value, since the selection of a dog best suited to the environment must necessarily be a matter of no little importance.

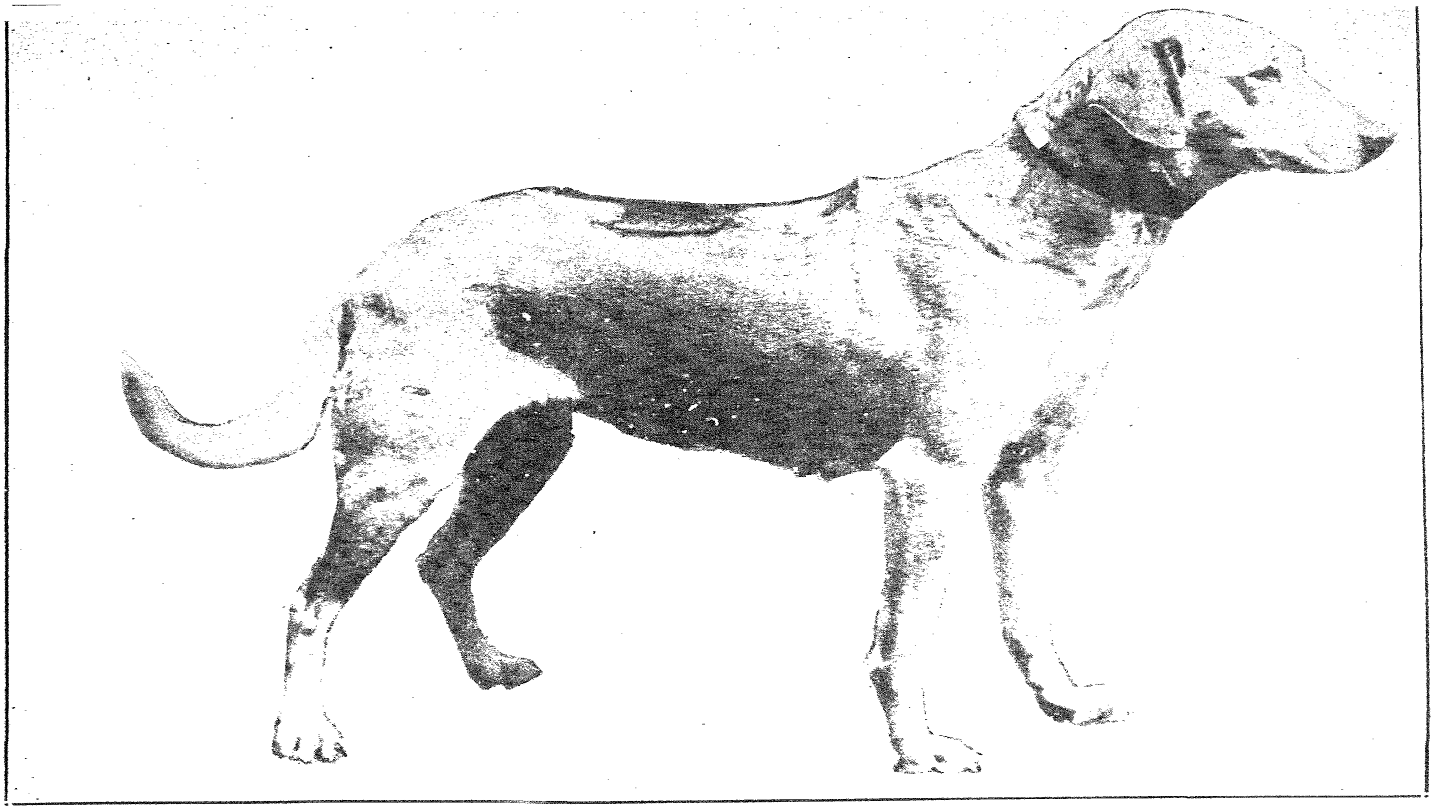
The ideal Ridgeback is an animal of from 24 to 26 inches in height and around 65 lbs. in weight, smooth and sleek in coat and usually wheaten red or fawn in colour, strongly built, with marked indications of speed, agility and endurance, racy in outline and attractive to the eye. In addition to this he has a ridge of hair, which grows along the spine from wither to hip in a direction contrary to the rest of the coat. Hence the name.

The origin of the breed is not definitely known, but the most generally accepted view seems to be that he is the result of an intermixture of the Cuban bloodhound and the Hottentot hunting dog, the latter supplying the characteristic ridge.

From such a breeding one would expect just the characteristics which the Ridgeback so markedly shows—speed, power, courage, fidelity and affection, and, in addition, a remarkable skill in tackling wild animals. Unfortunately for the breed, the name "Lion Dog" got attached to this dog because several of the early big game hunters—Van Rooyen, Selous, Upcher and others—found them outstandingly the best for lion hunting, and this led many unthinking people to assume that the dogs were the actual killers of

[By courtesy of the "Chronicle," Bulawayo.]

His Excellency the Governor with Loben, 1st in Ridgeback Open Class, Salisbury Show, 1930.



Rhodesian Ridgeback, Virginia of Avondale, S. African champion, 1928. (Owned by Mr. T. Kedie Law, Avondale, Salisbury.)

lions. A little thought would have made it clear that not any dog known would have a chance in actual fight with a lion. What the Ridgebacks do, and do so effectively, is to harass the lion by constant and cleverly-made feint attacks until he, or she, is held up in sheer bewilderment, giving the hunter exactly what he is waiting for, a deliberate shot at close range. To do this effectively needs courage, agility, endurance and an instinctive skill, which this breed seems to possess in a striking degree. Many extraordinary stories of the sagacity of the Ridgeback could be related, and of their devotion and care of their owners. Fidelity is a marked characteristic, and they repay affection many-fold. There is no finer pal amongst dogs nor more intelligent companion. For the lone man, the Ridgeback is the ideal dog. He is a utility dog also, and can be trained to be a very satisfactory gun dog. He has excellent scenting powers, scarcely second to the special gun dog breeds, and if you wish a brace of birds for the pot, and will take a little trouble to show him what you want, he will certainly find them for you. As a guard for house and home, he has proved himself outstandingly to many. He is peculiarly attached to his owner and his family, but distinctly standoffish to strangers, not aggressive nor treacherous, but indicating quite plainly that he "tolerates" strangers. His low growl to a stranger is an indication to stop, which is obeyed without question. As a house guard, the following authentic incidents are mentioned:—Mrs. X, on a farm, had occasionally to be left alone for several days, and neither she nor her husband cared for these occasions. A friend gave her a beautiful Ridgeback, which very soon had attached itself to its new owners. The husband's absences were no longer feared, for on these occasions the Ridgeback never left its mistress day or night, and not even their old plough boy, who had been with them many years, dared come inside the garden gate until the mistress had called, "All right; let him come." Another instance of intelligence in the same dog:—X, working some 200 yards away from the homestead, heard the dog barking in a peculiarly persistent and unusual way. He jumped on his bicycle and raced to the back door of the house and called to his wife to know what was the matter. She replied that she didn't

know, but "D" (the Ridgeback) was behaving most peculiarly and would not let her go along the passage to the front door. The husband tried, and "D" did just the same with him, going so far as actually to push him back. At last he decided to go round the house, and, on arriving at the front door, found a huge banded cobra lying on the door mat.

Illustrating a somewhat different aspect, a settler had five Ridgebacks, which were the care of a special piccanin, who groomed and fed them. The piccanin went to the compound to sleep, and even he, their personal attendant, dared not enter the house enclosure after the house boy had once left the kitchen at night. If it was necessary for any boy to enter the enclosure after dark, he had to stand at the gate and call until the owner or his wife called permission for him to come in. At this house some mutual friends called, having made a longish motor run to arrive at tea time. On arrival, they were greeted by five Ridgebacks in a row on the top step of the entrance, all perfectly quiet and intently watching. On commencing to climb the steps they were met by a chorus of muffled growls. They took the hint and stood still, calling for the boy. On the boy's arrival the dogs quietly retired from the entrance and followed the visitors into the lounge, where the boy gave them tea, etc. Their hosts were out in their car. The five dogs lay about the room intently watching and ignoring all overtures of the visitors to make friends with them, and as the visitors left the house they were closely escorted to the garden gate by the five Ridgebacks. Shortly after leaving the house they met their friends returning. When they pulled up on the road they related their experience with the dogs, much to the owners' amusement. They turned back to the house, and on arrival were formally introduced to each dog, and before they left were already great friends with them.

These anecdotes are authentic, and are quoted simply as illustrations of the character of the Ridgeback as a house dog. Of his qualities as a hunting dog, owners are the best references. From time to time episodes are mentioned in the Press like the one quite recently, when Mr. J. du Preez bagged three lions in a few minutes with the aid of his three

Ridgebacks, one of which was a puppy. Farms have been freed from baboons and wild pig by a pack of four or five Ridgebacks.

The Rhodesian Ridgeback Club was formed some six or seven years ago to restore the purity of this breed, and is anxious to give information to all who are interested. The local secretary can be addressed at P.O. Box 554, Salisbury.

Weather Forecasts.—The usual daily forecasts will be commenced during October. These forecasts are based on synoptic weather data collected by telegraph from the Union of South Africa, South-West Africa, Portuguese East Africa, Nyasaland, Northern Rhodesia, Belgian Congo and Mauritius. They are issued daily at about 12 noon and telegraphed to all Departmental Post Offices throughout Southern Rhodesia, and are available at these offices for the general public. The message consists of a detailed forecast for the period of 24 hours from noon of the day of issue, and of a "further outlook" in very general terms covering the following day, or at times of settled weather, a period of several days.

Some Further Notes on Cotton Growing in Southern Rhodesia.

By G. S. Cameron.

What one may consider the second serious attempt at cotton growing in Southern Rhodesia has now undergone its first year of trial, and it may be safely stated that results so far have just about come up to expectations. There have been a few outstanding successes as well as a number of failures. On the whole, however, there has been a sufficiency of fair to average crops to justify a continued effort on the part of growers, who now feel much more confident than formerly.

Contrasting the situation a year ago with the present position, there are a number of points which require serious consideration. First of all there is the question of seed supply. The ordinary U. 4 seed issued in 1929 did not, in many cases, germinate as well as was anticipated. This to a large extent was due to the limited quantity available for issue. With only some 60 odd tons of seed to meet the country's needs, it was necessary to reduce the seed rate per acre to 10 lbs., whereas double this amount should have been allowed. Whether it would have been better to have doubled the seed rate and disappointed many applicants is still a matter of doubt to the writer. Had the former policy been adopted, however, it may be assumed that stands generally would have been much better and final yields correspondingly greater. The situation to-day is quite different, as there is an ample supply of seed in the country to meet all demands, even at treble the seed rate which was used last year. It is too soon as yet to make any definite pronouncement as to what the final yield of cotton will be for this year, as ginning has continued longer than was originally anticipated. Although the final yield may not come up to

expectations, the general behaviour of the crop may be termed satisfactory if we accept the opinions of leading cotton growers throughout the country who have given U. 4 cotton a fair trial. Several have decided to increase their acreages next season, while it is expected that others will take up cotton growing again on a more modified scale. This, despite the fact that prices have been far from attractive, goes to show that there appears to be a growing confidence in the crop.

For those who propose to grow the crop for the first time it is hoped that the following notes will prove helpful, while for the more experienced growers the remarks on spacing and fertiliser may be of considerable benefit.

Choice of Land.—It can be safely stated that cotton will grow on any good land in Southern Rhodesia, provided it is well drained and situated in areas where the rainfall will permit of early planting, that is to say, in November, though it should be remembered that crops at the higher altitudes run the risk of being checked by early frosts in certain years. Satisfactory cotton crops have been recorded on soils varying from white sand to rich chocolate loams. On the heavier soils, however, the crop takes longer to mature, and it is perhaps risky to attempt cotton growing on rich soil at a high altitude, except in seasons of early rainfall. Where there is a possibility of growing, say, ten bags of maize per acre, it might be better to grow that crop in preference to cotton. On otherwise good maize lands which, however, have become worn out through continuous cropping, it would be worth while to give cotton a trial. By so doing it increases the yield of maize the following season, after which the land should be put under a green crop.

It is felt that enough is not yet known about the behaviour of U. 4 cotton on new land to permit any definite ideas being formed, but there are a sufficient number of successes to justify its being given a trial.

Fertiliser.—The fertiliser trials which have been conducted on the Cotton Breeding Station at Gatooma with surface application at time of planting do not show any appreciable increase in the yield of cotton as a result of fertilising. It does not follow that similar results would be obtained on different soils or on other areas, especially

in sand veld areas, but there is not sufficient evidence to show that any known fertiliser treatment will definitely increase the yield per acre in Southern Rhodesia. In the meantime, therefore, we do not recommend the use of fertiliser, but would prefer to see it applied to other crops to be followed by cotton.

Date of Sowing.—On general principles the earlier the cotton can be planted the better—that is, providing one can be reasonably sure of sufficient rains to carry the crop through the seedling stage and allow it to become established. Cotton planted towards the end of October or early in November should stand a very good chance of success in those areas where it is becoming an established crop. Even late planted cotton may pull through in seasons of light rainfall, but as it is impossible to forecast how the season will turn out, it is better not to take any unnecessary risks.

Planting.—Whether planting is carried out by hand or by machine, it is very necessary to use plenty of seed, as much of the cotton seed in Southern Rhodesia is affected by stainers, which reduce the germinating capacity. As there is now an unlimited supply of seed in the Colony, it is false economy to plant sparingly. For machine planting it would be as well to allow 25 to 30 lbs. of seed per acre. If planted by hand, it would be advisable to plant six or seven seeds per hill.

The question of dry planting is one which each farmer has to settle for himself. If this method is adopted there is a chance that light rains might germinate the seed, but not be sufficient to establish the plants, which would wither and die off. In such a case the cost of the seed plus the labour cost in planting would be the only loss. On the other hand, if the rains were sufficient to establish an early crop, the advantage of getting it so established would far outweigh any risk of having to replant.

If dry planting is adopted it is well to remember that sufficient seed must be kept in reserve in case it is necessary to replant.

Spacing.—The advice given with regard to spacing last year has to be modified, as the advantages of a closer spac-

:ors to the Cotton Breeding Station, Gatooma, to meet Sir James Currie, K.B.E., C.M.G., Director of the Empire Cotton Growing Corporation, and Mr. Arthur Foster, the vice-chairman.

ing are becoming apparent. The spacing trials at Gatooma, supported by trials conducted throughout the Colony, show that of the four spacings tried—6-in., 12-in., 18-in. and 24-in.—the 6-in. spacing gave the heaviest yield per acre under last season's growing conditions. There are arguments for and against so close a spacing, but the former far outweigh the latter. The close spacing gives more plants per acre and does not leave so many blank spaces in the field after cutworms and white ants have taken their usual toll, and the experience of the past season has shown the great importance of a good stand. There are always a certain number of unavoidable casualties in every cotton field, and the more plants there are in it to begin with the better.

Another advantage of close spacing is that it materially helps to set an early crop, which is of considerable benefit with the type of bollworm attack experienced during the last two years.

The one outstanding disadvantage of close spacing would be in the event of a severe and prolonged drought. The closer spaced plants would then have to compete for the available moisture in the soil, and might suffer accordingly.

For those who possess rich alluvial soil it would be worth trying an even closer spacing, but it would be better to try it out on a small scale first. It would not do any harm, and might give useful information, if a few rows were left practically unthinned, with continuous plants at, say, 1 in., and their final yield compared with adjoining rows spaced at 6 ins.

When the young cotton plants attain a height of 6 or 8 ins. they should be thinned out, leaving one plant every 6 ins. Thinning out and hand weeding between the remaining plants should be carried out in one operation.

Cultivation.—The oftener cotton can be cultivated in the early stages the better. As soon as the young seedlings are through the ground so that the rows are distinctly visible they should receive their first cultivation. The number of times cotton should be cultivated will depend on the amount of weeds in the crop. As a general rule it is necessary to put the cultivators through about four to six times. If weeds persist, it would be better to abandon part of the

crop and concentrate only on as much as can be kept clean. It is useless to expect a good yield of cotton if the crop is choked with weeds.

Stainer Traps.—About the end of February, or as soon as stainers commence to make their appearance in the cotton fields, attempts should be made to keep them in check as far as possible. This is done on the Cotton Breeding Station at Gatooma, where the procedure adopted is as follows:—About fifteen traps per acre are placed under cotton bushes. The trap consists of a double handful of old cotton seed, which is first of all soaked in water. By putting the trap on the ground under the cotton plant it gets the benefit of shade, which helps to keep it moist. The trap acts as a bait for the early broods of stainers, which collect on the moist seeds and lay their eggs. After the first day or so a boy should be sent round to collect the stainers, and at the same time, if necessary, moisten the traps with water. When the seed in the traps has germinated the traps become unattractive, and fresh seed must be set. The seed from the disused traps should be collected and destroyed. At the same time that the boy is going from trap to trap he can collect any casual stainers he may see on his journey.

Once the first bolls begin to open the traps lose their effect, as stainers prefer to collect in the early opened bolls. Trapping can then be discontinued. The chief point in favour of the traps is that they help to keep stainers off the young unopened bolls, which otherwise they would puncture and destroy.

The main drawback to trapping seems to be its simplicity. It often happens that when the system is recommended one is immediately met with suggestions for improvement, such as poisoning the traps or using some contrivance to kill the stainers while on the trap. Many of the suggestions have been tried out, but so far the simple method of collecting mentioned above has proved best. The cost is not great. Actually it works out at about one boy per 40 acres for a period of about two or three months. If the crop promises to be a good one, it is surely worth endeavouring to save as much of it as possible from stainer damage.

The benefits derived from stainer trapping on the Cotton Breeding Station and the superiority in the germinating quality of the seed have been so marked that it is now considered advisable to recommend the system to be put into general practice.

Picking.—In an ordinary year cotton should be ready for picking in about six months from date of planting. There is no hard and fast rule as to when cotton should be reaped, but it is well to remember that the longer the cotton is left on the plant, within limits, the easier it will be for the labourers to bring in a fair amount of seed cotton per day. It is difficult to define what constitutes a fair amount of seed cotton for a boy to pick. At present the native labour of the Colony is not sufficiently experienced in picking cotton to be able to gather a large daily amount. On a good, well-opened field of cotton an experienced picker will bring in as much as 100 lbs. of seed cotton per day. To begin with, it would be better to set a much lower standard in this Colony until natives become accustomed to the work, and growers should be satisfied with 40 to 60 lbs. per picker on a good crop.

Sorting.—Pickers should be gradually trained to pick only the white unstained cotton in the field. Stained and dirty cotton should be left on the plant until the end of the season, when a final clean-up of all the cotton in the field can be made. Even in the best fields, however, there will always be a certain amount of stained cotton, and this should be picked out when baling the seed cotton for despatch to the ginnery. Too much time should not be wasted on this operation, as there ought not to be much stained cotton to be sorted out if the pickers have been trained to do their job properly.

Seasonal Notes on Tobacco Culture.

SEED BEDS.

By the Tobacco Division.

Although the majority of growers have already burnt the site for their seed beds and sown the first, the following notes may prove of some value to those who have grown little during the past few years, and to those, particularly growers of fire-cured tobacco, who may be starting growing for the first time this season.

The site selected for the beds should be near a permanent water supply; it must be well drained and protected from the wind. The soil should be fertile and contain a large amount of humus, particularly if the soil is on the light side, as this tends to reduce the amount of watering and to hold artificial fertilisers in the soil. The whole area of the beds should be burned over, using either brushwood beaten down to a height of 1 ft. 6 ins. or maize cobs 6 ins. high. All unburnt matter should be raked off the beds, as it has a tendency to kill the young plant roots, and the ash should be dug in, as it constitutes a valuable source of potash. Beds are generally some 25 yards long by 3 to 4 ft. wide, and must be bricked in round the sides, leaving a pathway of a foot or so between each bed.

The soil should be well pulverised and some artificial fertiliser added. If the materials are available, an excellent fertiliser for beds consists of one part of nitrate of soda or sulphate of ammonia with two parts of supers, and applying at the rate of 3 to 4 lbs. per 30 square yards. Another excellent dressing consists of 1 lb. of a normal commercial seed bed fertiliser applied to every 4 to 5 square yards.

The cleaned and treated seeds should be sown at the rate of one level teaspoonful every 10 square yards, mixing the seed either in mealie meal and scattering over the beds, or stirring in a watering can and sprinkling through a fairly fine rose over the bed. The seed must be continually agitated in the can if an even distribution of seed throughout the bed is to be secured.

After sowing, the bed should be watered. If the seed is not planted by means of a watering can, it should be lightly pressed into the soil by means of a plank or by tramping of feet. It is as well to cover the freshly sown beds with a layer of combed grass, which reduces the evaporation and so tends to curtail the labour of watering.

During the time the seed is germinating the soil should be kept moist, but never water-logged, as the soil temperature does not rise quickly and a poor stand in the bed will result. Covers of combed grass or cheese cloth should be placed over the beds as soon as the seedlings start to sprout, though the latter is preferable, as there is not so much time wasted on management. Watering should generally be done twice a day, though at certain periods more frequent watering may be advisable.

Should the plants appear to be growing very slowly after the second week of germination, and be of a yellowish colour, it would be advisable to sprinkle them with a little nitrate of soda solution made up by dissolving 6 lbs. of nitrate in 50 gallons of water, and sprinkling this on the bed at the rate of a gallon per 3 square yards. The solution should be immediately washed off with water to prevent burning. A substitute for the nitrate of soda consists of fowls' manure, to which should be added an equal volume of water. This should be stirred each day for six days. To one gallon of this mixture should be added 8 gallons of water, and it should be applied to 10 square yards of seed bed. This should also be followed by a wash of fresh water to prevent burning of the young plants.

In order to produce strong, healthy seedlings, spraying of the beds should be established as a routine practice, the most suitable spray being Bordeaux mixture in the concentration 4—4—50.

If insect pests are troublesome, a spray or dust of lead arsenate should be used to hold these in check. Normally the plants should be sprayed once a week with the Bordeaux mixture, though this is likely to depend on the climatic conditions, such as a shower of rain washing the mixture off the leaves. In general, it may be said that the plants should be sprayed sufficiently often to give them an even blue coating on the leaves.

During their early stages of growth the plants should be watered from a can containing a fine rose; later a large rose should be used. When the plants are well rooted a rose may be replaced with a small square of tin clipped to the watering can and bent in such a fashion as to cause the water to fall in a broad, flat spray. Care should be exercised that, when watering, the seed bed covers, particularly if cheese cloth is used, be removed, as the water has a tendency to run down only at the stakes and bricks, giving a very uneven and ragged bed owing to certain patches receiving little or no water.

At first the beds should remain covered the whole time. When the plants have grown a little the covering should be left off a little each morning to allow the plants a larger share of sunshine. This period is gradually lengthened as the plants grow, until by the time the plants are the right size for transplanting, the covers are left off all day and only replaced at night. This procedure hardens the plants and enables them to withstand transplanting. After plants are nearly ready for transplanting they should receive only as much water as will prevent their wilting.

Prior to removing seedlings from the bed they should be well watered to remove the plants without damage to themselves or those remaining in the beds.

The Turkey.

By G. H. Cooper, Assistant Poultry Officer.

There is good opportunity for development in profitable turkey raising in Southern Rhodesia, where there are large tracts of country admirably suited to the raising of large flocks if proper methods of management are followed. The sand veld areas are notably excellent for the raising of turkeys.

Turkeys can be kept under very simple conditions in this Colony, so that the capital outlay in the enterprise is quite small. Except during the growing season of the young poults, the management of the flock is a fairly simple matter. The vigour of the breeding stock must be carefully watched. Sanitary conditions are necessary always, especially in the young poults' quarters.

Turkeys range far and should only be kept in large numbers when free range conditions are available. They pick up a tremendous number of injurious insects in the lands and waste grains, and so turn into profit what would otherwise be wasted or be actually harmful. As much advantage as possible should be taken of this natural habit of the turkey, both from a point of view of saving waste and for the general health of the birds themselves.

Varieties of Turkeys.—The domestic turkey of to-day came originally from North America and is the lineal descendant of the wild turkey. All domestic varieties have descended from the wild stocks and comprise some six or more varieties to-day. These are the American, or sometimes termed Mammoth Bronze, White Holland, Narragansett, Bourbon Red, the Slate, and the Black or Norfolk.

The American Bronze.—This is undoubtedly the most popular breed in Southern Rhodesia and probably the world over, because of its size, early maturity and hardihood.

The Bronze males are distinguished in colour by the rich, brilliant, copperish sheen of plumage in neck, wing bows and wing coverts, breast, back, body and fluff, against a background of black and brown, each feather terminating in a narrow black band across it. The wings are barred black and white, and the main tail feathers and tail coverts have a wide white edging. The body colour is dark black brown, with a wide brilliant bronze band extending across the feathers and tipped with a narrow edging of white.

The plumage of the female is similar to that of the male, except for an edging of white on the black bars of the feathers on the neck, breast, wing bow, wing coverts and back. This white edging gets broader as it approaches the rear of the body. Shanks and toes are deep pink. Any colouring other than this denotes an admixture of alien blood.

The White Holland or Austrian.—The plumage should be pure white in colour and free from black flecking or ticking. Shanks and toes are white or pinkish white. The most prolific variety.

The Narragansett.—In colour resembles the Bronze, but the barring is a metallic black with light grey edging, and a black background with a broad white edging. The white wing band and white edging of main tail feathers and coverts give this variety a lighter appearance than the Bronze. The primaries and secondaries of both sexes are distinctly and evenly barred with black and white or grey. The female generally gives a lighter appearance than the male. The barring should be rich black and not bronze in the females.

The Bourbon Red is rarely met with in Southern Rhodesia. In colour it is a rich, deep, brownish red, except the primaries and secondaries of the wings and the main tail feathers, which should be pure white.

The Slate has ashy blue or slate-coloured plumage, sometimes dotted with small black spots.

The Black or Norfolk is of a solid black colour, with a lustrous greenish-black sheen.

STANDARD WEIGHTS.

Variety.	Adult Tom 2 years or more.	Yearling Tom 1 year and less than 2 years.	Cockerel less than 1 year.	Hen 1 year or more.	Pullet less than 1 year.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
American Bronze	36	33	25	20	16
Bourbon Red ...	30	25	20	18	14
Narragansett ...	30	25	20	18	14
White Holland ...	28	24	20	18	14
Slate	27	22	18	18	12
Black or Norfolk	27	22	18	18	12

The adult male over one year is known as a "tom" or "cock," and the female as a "hen." From when the sex can be distinguished till one year, the male is known as a "cockerel" and the female as a "pullet." Before the sex can be distinguished, the young turkeys are known as "poults."

In distinguishing the sex of poults look for a small fleshy protuberance on the breast; this will later grow a tuft of coarse hair. This protuberance appears on males at about four months of age, but the females do not get it until they are about one year old. The hairs are much coarser in the male than the female. The "dew bill" or fleshy protuberance on the top of the head is larger and more elastic in the males than the females. The adult males have a spur of horny structure on the inside of each shank; in the female it is very rudimentary. At about two months of age the poults have developed fleshy caruncles on the head and upper part of the neck, the appearance of which is known as "shooting the red."

Breeding Birds.—Select your breeding birds before large numbers are sold from the flock for the Christmas market. You have a larger number to select from, and the best developed birds can be saved for breeding instead of being sold. It is better to start with a breeding pen than by purchasing eggs for hatching.

The breeders should have large frames, well adapted for meat production. The back should be broad, especially over the shoulders, and the width carried well back. The

body must be deep, with a well-rounded breast carried well forward. Vigour in the breeding stock is of paramount importance. A full bright eye, broad head, good bone, strong legs set well apart and not too long are desired.

Selection of the best breeding stock is very important, and failure to do so in the past is mainly responsible for the under-sized stock of which we see so much in Southern Rhodesia to-day.

Management of Breeding Stock.—Adult turkeys do not require much protection from the weather in Southern Rhodesia, but it is just as well to provide them with reed or grass protection of some description, with perches, to keep off any damp, cold weather which may be experienced.

Breeding birds as a general rule are allowed free range, and this method is ideal, provided the nests can be found easily, when a shelter should be built over them to secure them from vermin. Sometimes thatched shelters are made near the house or roosting place, and, if encouraged, very often the turkey hens will adopt them. These may be made comparatively safe from vermin. However, to be really safe from these pests, it is perhaps advisable to keep the breeding birds in a wired enclosure. Sufficient room to afford plenty of exercise is necessary, a flock of 15 birds requiring half an acre. An orchard forms an ideal spot. Four-foot pig netting is enough to keep the birds in, for as a rule they cannot rest on the top wire and so do not fly over. However, if they persist in getting over, the flight feathers of one wing may be cut, or, as in some countries, a small piece of light board may be fastened across the back by notching the board and tying it with a strip of cloth to each wing, so that when the wings are raised they strike against the board and prevent flying.

Where free range is practised and there is difficulty in locating nests, confine the birds early one morning as they come from the roost and do not let them out until the afternoon, when, as a rule, they will make straight for their nests to lay the eggs which they have been holding up.

Feeding the Breeding Stock.—This is a simple matter. It is important, however, to keep the breeders in good condition, and they should be well fed, but not over-fed. Where

turkeys have plenty of free range they should obtain an ample supply of insects, green feed and seeds, but it is also advisable to give them a daily feed of grain, such as a ration of equal parts of maize, wheat and oats, if possible, fed preferably just before they go to roost. See that the grain is wholesome. During bad cold weather an extra feed of grain may be given daily. If maize is the only available grain, too much should not be fed, but a little bran mash should supplement it. If green food is scarce on the range, it should be supplied. Cabbages and roots, such as carrots, mangels or pig melons (majorda), are excellent. Thick separated milk is very desirable to use with the grains, and if it is not available some kind of animal food should be fed, preferably in a laying mash during the breeding season. Feeding should be regular, but not overdone, especially the maize part. Change the place of feeding frequently. Liberal supplies of grit, oyster shell and charcoal must be given.

Mating.—Best results from the standpoint of mating are obtained when from 8-12 females are mated to a healthy, vigorous tom or male bird. If more hens are kept, more males should be used, but great care should be taken not to allow two toms to run together. When from 20-25 hens are kept, the toms should be alternated every other day.

The selection of the tom from the standpoint of type and constitutional vigour is very important; the females should also be kept up to standard as far as possible. Most of our females in Southern Rhodesia are too small. The aim in mating up a breeding pen should be to choose birds as near standard weight as possible.

Best results are obtained when a vigorous, well-grown tom cockerel is mated with yearling hens (between one and two years). Sometimes early hatched pullets are used; if so, they must be well matured, otherwise there is great danger of lowering the vitality of the stock. Yearling and older toms may be used if desired, but their excessive weight may cause injury, while they are not so active, and fertility is sometimes poor. When they are used, their spurs and nails should be trimmed. They should be mated with early hatched, well matured pullets to obtain the best fertility.

Egg production decreases materially after three years, so it is advisable to replace any three-year-old breeders with younger birds. Turkeys should not be in-bred, as it results in lowering the vitality and growth of the stock. Obtain new blood by purchasing male stock from some outside source. Great care should be exercised in choosing breeding males from reliable breeders, whose stock is first of all healthy and vigorous, approaches standard weight and possesses other standard qualities to a high degree.

Egg Production.—The natural time for turkeys to lay is during the late winter and spring months. Any laying mash, if fed to the breeding birds a month or so previous to the time when eggs are desired for hatching, should bring them into lay, if any trouble is experienced in this respect. All hens do not begin to lay at once, and six weeks may elapse between the commencement in individuals. Usually a hen starts to lay about 10 days after the first mating, and she has by that time found a nesting place. Turkeys lay in clutches—on the average, about 20 eggs are laid in the first clutch; the hen then goes broody. When the broodiness is over, another clutch is laid, and often a third, each clutch containing fewer eggs. Hens may be made to lay more eggs if the eggs are taken away as they are laid, always leaving one in the nest, or if a laying mash is fed during the breeding season. When the hens are not required to hatch their eggs, they may be broken of their broodiness by putting them in a wire coop until they are over the broody fever, when they will commence to lay again. This is desirable where incubators are used for hatching, especially in hatching the first clutch, for it saves time, and the second clutch is laid sooner, thereby enabling one to hatch more early chicks, which grow out much better.

Hatching.—The success in turkey raising depends upon the number of birds brought to maturity in proportion to the number of eggs set. High fertility is necessary. The vigour of the breeding stock, the manner in which it has been managed and the care given the eggs will determine to a large degree the quality of the hatching eggs. An average of 10-15 mature birds raised for each hen is considered very good.

The eggs should be collected regularly every day and kept in a room at a temperature of 50-60 degrees Fahrenheit. They should be turned every day carefully, and, for the best results, should not be kept longer than 10 days before setting. The period of incubation of turkey eggs is 28 days, and the method much the same as with chickens. They may be hatched in incubators, under turkeys or chicken hens, but the latter is not advised. Likewise, they may be brooded artificially or with turkey hens. The first method is the better, especially where large numbers are reared, for the poults are not so liable to contract disease and vermin that way.

When hatched in incubators, the temperature should be slightly lower than that required for hens' eggs. Start the machine off at 101 degrees Fahrenheit, when, by hatching time, it may go up to 103 degrees Fahrenheit. The eggs should be turned two or three times daily and tested on the 10th and 20th days, removing all infertile eggs and those having dead germs. On the 26th day the incubator door should be darkened and kept closed until hatching is completed. Day-old poults may be despatched successfully if slightly larger boxes than commonly required by baby chicks are used.

The turkey hen when broody should be allowed to sit on the nest for two or three days before being entrusted with the eggs. When she has remained constantly on the nest for two or three days she should be given her eggs, preferably slipped under her at dusk. Turkey hens when sitting should be dusted with sodium fluoride under the feathers next the skin. A pinch on the head, under each wing, between the thighs, below the vent and along the breast is sufficient. This is important and should be done at least twice, once when the hen is set and once before hatching, to ensure that the poults may get a good start free from lice, which are very dangerous to newly-hatched poults. The nests should be covered, so that the hens will not be disturbed. At the same time turkey hens often sit too tightly, and should be taken off daily and allowed to exercise and dust themselves. They should have access to clean, cool water at all times, and should be given wholesome grains as feed. Maize, sunflower, wheat and oats are excellent. When hatching

is completed, the hen should be dusted, as stated previously, and put in a warm, roomy, comfortable coop, with plenty of dry cut grass on the floor and slats in front, in and out of which the poults can run at will, but the turkey hen herself must be confined, otherwise she will drag the poults through the long and often damp grass and heavy losses will result.

Rearing.—This is the most important part of turkey raising, for the greatest losses invariably occur during the first five weeks after hatching. Heavy mortality among the poults indicates that the breeding stock used was low in vitality or poorly managed.

Both the poults and breeding turkeys must be kept on ground free from any infection and away from chickens. This is important. The poults should be raised entirely separate from the chickens and the breeders away from the rest of the poultry on the farm. Care must be taken to guard against draughty, badly-ventilated coops and dampness, for young poults cannot stand much of this. Keep them comfortable and well fed, the digestive system healthy and disease will not find a port of entry.

Rearing the poults by turkey hens is not a difficult matter, although there are several details which should always receive careful attention. As stated previously, when the hatch is completed the hen and her brood should be transferred to a roomy coop with slatted front, which will afford protection from rain, wind and predatory animals. A coop of the apex type, 5 ft. long by 3 ft. wide by 3 ft. high, is required. Each hen should have a separate coop, and these should be placed some distance apart on well-drained clean soil, where the grass is fairly short. The first day the poults should be confined with the hen, after which they may be allowed out. A small wire netting run may be provided, but it is not absolutely necessary, as they will not wander far from the hen. Care must be exercised not to allow them out during rain or if the grass is wet. The coop should be moved to fresh ground every day and should be cleaned and disinfected frequently. When the poults are a fortnight old they may be allowed to roam with the hen, and should do so; see that they all return at dusk and are safely housed at night from predatory animals. During wet

weather they should be confined, as any dampness is usually very fatal to young poults. In continuous inclement weather they may be housed in a barn with short dry grass, if this is possible. The poults may be kept with the mother hen for a long time, but better results are obtained by moving them to a separate rearing field when they are about 12 weeks old.

When artificial incubation is employed, artificial brooding usually follows. The poults should remain in the drying box of the incubator until they are 24 hours old; they should then be taken out and placed in a brooder similar to that used for ordinary chicks, with a wire run attached, and treated in the same way. The brooder and coop should be moved to fresh ground daily. (See article entitled "Artificial Incubation, Brooding and Rearing of Chicks," *Rhodesia Agricultural Journal*, June, 1929, reprinted as Bulletin No. 740.)

The artificial method of brooding makes it easier to maintain proper sanitation; it puts the poults more directly under the control of the person in charge and gives the breeding birds more time for laying, thus more poults can be reared from them during the season. Brooding by turkey hens has the advantage of allowing the poults to be raised in small flocks and of readily providing free range conditions. There are disadvantages, however, especially as the young turkeys may contract disease and parasitic infection from the hens or they may wander too far, and losses occur through storms or by predatory animals.

Turkeys, when reared in large numbers, may be brooded successfully by means of the hover stove and portable colony house.

It is a good plan to adopt some system of marking the poults when raised in any numbers, either by toe-punching or wing-banding, in order to keep accurate records of birds from special matings or for identification purposes if a near neighbour also raises turkeys.

Feeding.—The feeding of the poults is a very important matter, both from the standpoint of the kinds of feed given and also the manner in which they are fed. Unwholesome feeds and improper methods of feeding, especially if the

poults are confined, have resulted in many failures in turkey raising. Many are killed by over-feeding and by being supplied with sour, stale food. Poults, being less active than chicks, sometimes have difficulty in learning to feed when artificially brooded. Dipping their beaks in milk and giving sharp, shiny grit helps to induce them to eat. Poults under free range conditions are less liable to suffer from improper methods of feeding.

The same rations and methods of feeding used for baby chicks are often used for rearing turkey poults. The turkey hen, whilst confined in the coop, should be given a grain mixture of maize, sunflower seeds and wheat, or any of the suitable farm grains. Green food, grit and clean, cool water are also necessary. In feeding the hen and poults, it is advisable to feed the former inside the coop and the latter outside, in order to prevent her from eating the feed intended for the poults. After 10 days or so they may be allowed out on free range together.

No food should be given the poults for 36 hours after hatching; access to clean drinking water and a little coarse sand and finely-chopped green feed is all that is necessary. Their first feed may consist of stale bread soaked in separated milk and squeezed dry, fed five times a day in small quantities so as always to keep them hungry. If they are picking up insects and other food around the coop, three feeds a day should be sufficient. See that the food is properly dry, as wet food soon becomes sour and is fatal to them. It is best fed in troughs. Milk, especially butter milk, is excellent for them. Keep it before them all morning and give them water during the afternoon. The only grain required is finely-crushed maize and munga, preferably fed in a thin layer of finely-chopped grass to promote exercise. If a mash is desired, the following may be fed in a small hopper: 30 lbs. mealie meal, 15 lbs. bran, 10 lbs. pollard, 5 lbs. lucerne or sunflower leaf meal, 3 lbs. meat meal or other animal food, 3 lbs. bone meal, or equal parts of bran and mealie meal with a little bone meal, in conjunction with sour separated milk and green food, will give excellent growth. The green food should be placed in a receptacle. Chopped onion or eschalot tops, lettuce, lucerne, etc., are all excellent. Grated or finely-chopped carrots are greatly relished, and are

an excellent feed for them. Small grit or coarse sand and charcoal should always be before them.

After the poults are from six to eight weeks of age they may get most of their living from good range, but a little additional grain feed, as crushed mealies and munga and even mash, will give added growth and earlier maturity. Milk in some form is very desirable in their feed. Feed the poults on range regularly every night and they will return home on their own, but it is usually advisable to have a piccanin in charge of them.

During the spring and summer, turkeys can find much feed on the average farm. Grasshoppers and other insects, weed and grass seeds, green vegetation, berries and grain picked up in the fields make up their ration. When this natural food is plentiful very little need be added, except a small feed of maize every evening to bring them home, or, if food is scarce, a large feed of grain in the evening.

When the birds are being prepared for market they should have, in addition to their evening feed of maize, one of preferably wheat, or, if unobtainable, maize, in the morning; but this should only be a small feed so that they will still be hungry when they go on range. This may be increased gradually and a further feed given at midday, until they will finish up three good feeds a day about a week before marketing. The ration at this time may be varied with the addition of sunflower seeds, and ground nuts are also excellent. Small chunks of carrot are excellent for them at this stage too. Thick separated milk if available cannot be over-estimated as a feed. Charcoal should be supplied. Turkeys should not be confined for fattening, as they mope and lose weight, but the amount of range may be somewhat restricted. Feed last season's maize in preference to new grain, but it must be wholesome and not musty.

Remember that more feed per pound of gain is required as the bird gets older.

Marketing Turkeys.—In Rhodesia this can only be satisfactorily carried out by obtaining contracts for so many per week or month throughout the year with hotels, boarding houses, etc. To dispose of them haphazardly means a

most uncertain market, both as regards quantity and price; further, the turkey raiser can have no idea as to the number he will require to produce. There is always a good market at Christmas, but that is only once a year.

Housing.—A turkey house should never be erected on low-lying damp ground, nor upon heavy clay, for on such land turkeys will never do well. The house should be large, with an open wire netting front. It should at least be 8 ft. high in front and 6 ft. at the back, and from 8 ft. to 10 ft. deep, and as wide as necessary for the number. The roosts should be 4 ft. from the ground, running from side to side. The roof must be watertight and the house perfectly dry and airy, and on the floor a good layer of dry grass placed. Any material is suitable, provided the above points are attended to, e.g., well combed, thick grass, good pole and dagga, brick, etc., are all suitable.

Disease and Parasites.—Avoidance of parasites and prevention of disease should be the first aim of every turkey raiser. Good management will keep the flock free from parasites, and the selection of breeding stock having abundance of constitutional vigour will help materially in preventing disease. Turkeys should always be given the best possible surroundings. Provide free range on clean sanitary soil, wholesome feeds, including plenty of green food, protection from dampness, and strictly sanitary quarters.

Lice may be troublesome, especially among the young poults, often causing heavy losses. Head lice cause most of the trouble. Poults should be examined occasionally, and if the lice are found, a little lard should be applied to the head and neck. Sodium fluoride may be used very sparingly on the poults if body lice are found, but should not be applied until the poults are at least a week old, and then only two small pinches should be used—one on the neck, head and throat, and the other on the back and below the vent.

About the only diseases to which turkeys are subject are coccidiosis, roup and chicken-pox. Bulletins dealing with these can be obtained from the Poultry Officer, Department of Agriculture, Salisbury.

SUMMARY.

To be successful in turkey raising, one must give the most careful consideration to certain fundamental factors. The turkeys, especially the growing stock, must be kept under the best possible conditions. An abundance of free range on clean soil is greatly to be desired. Every effort should be made to keep the soil sweet and clean. This is particularly true of the soil on which the birds are fed and where they roost.

Another fundamental essential is to keep healthy and vigorous breeding stock in the best possible breeding condition. The breeders should get plenty of exercise and should not be fed too heavily on fattening rations. By breeding from the most vigorous birds every year, a flock of healthy stock may be developed and maintained. Great care should be exercised in the selection of male breeders each year.

Both old and young turkeys should be protected from dampness. In sections of the Colony where dampness is prevalent, or where rainstorms are frequent, the birds should be provided with suitable protection.

It is very important not to feed the poults too heavily, especially for the first few weeks. Keep them just a little hungry.

Watch the poults carefully for the appearance of lice, and take every precaution to keep this pest in check.

So far as possible, remove the cause of any disease that may appear. Clean soil, sanitary quarters and hygienic methods of feeding will do much to reduce mortality.

Success in turkey raising is largely a question of proper management.

Notes from the Irrigation Branch.

More Mixed Farming.—It is interesting to note that according to the return published in the Economical and Statistical Bulletin for 21st August, 1930, there was a 25 per cent. increase in the area under irrigation in this Colony as compared with the previous season. Including orchards and lucerne, which figure under the category of summer crops, the total area under irrigation in 1929 was 11,760 acres, and is a clear index of the increased attention that is being given to mixed farming, owing to the slump in the more spectacular crops.

The most marked increase in a single crop was in the area under wheat, which expanded by 40 per cent.; and as the average yield also increased from 2.1 to 2.8 bags per acre, the local production of the crop was almost double that of the previous season, and amounted to 12,900 bags. The value of wheat and wheaten products imported during the year amounted to £109,158, of which £37,165 was re-exported.

The only irrigated crop which showed a decrease in the area planted was winter potatoes, the area under cultivation being 8 per cent. less than in the previous year; but as the average yield per acre increased from 15.3 to 21.0 bags, the total local production of winter-grown potatoes was 18,830 bags as compared with 14,940 bags in the previous season. The declared value of potatoes imported during the year amounted to £23,873, as compared with £20,760 in 1928.

The average yields per acre of all irrigated crops showed a substantial increase over those obtained in the previous season, with the exception of barley, the acre yield of which dropped from 6.5 to 5.9 bags.

It is encouraging to note that the area under lucerne now amounts to 229 acres and that the average yield, viz., 3.9 tons per acre, compares favourably with that obtained in other countries.

The statistical returns appear to contain no data as to the area under irrigation for vegetables, although quite a number of irrigators have relatively large areas under truck crops for supplying mine contracts and in the neighbourhood of the larger towns.

Irrigation Schemes under Construction.—An example of persistence and faith in an irrigation project is displayed by Messrs. MacDougall and Spraggon, of Triangle Ranch, Ndanga district, who for the last six years have steadily proceeded under great difficulties with the expensive work entailed in the construction of the intake and head works of their extensive irrigation scheme from the lower reaches of the Mtilikwe River.

Details of the scheme were given in the *Rhodesia Agricultural Journal* of November, 1924, the work of constructing the weir and driving a tunnel about 1,500 feet in length through solid rock having been commenced in the previous winter. The tunnel was completed in July this year, and the total cost of the work, including the weir, has amounted to £3,500. The remainder of the work is child's play compared with what has been done, and will be completed at very moderate expense. Messrs. MacDougall and Spraggon hope to irrigate about 200 acres next season, and later extend the furrow to irrigate the full 800 acres for which they have obtained a water right. The potentialities of this portion of the low veld have to be seen to be realised, as it is one of the few areas in Rhodesia where extensive irrigation schemes are practicable and where soil and rainfall conditions will justify the expense involved. It is hoped that this scheme will be an example of what can be achieved in the low veld under irrigation, and that the owners will reap the success they deserve. At present it is intended to grow mainly fodder crops and lucerne for the fattening of stock drawn from the extensive ranching areas in the neighbourhood, and later possibly to irrigate easily transportable summer crops, such as tobacco and cotton.

At Naseby, near Que Que, Mr. T. Haddon is proceeding with the construction of an earthen storage dam which will irrigate some 40 acres of land. Considerable difficulty has been experienced in obtaining good foundations in the stream bed, and excavations had to be carried down to a

depth of 12 feet in this section. Owing to the delay caused by this fact, it is unlikely that the dam will be completed to its full height this season, and a temporary spillway will have to be constructed.

Mr. Bennett has practically completed the heightening of an existing storage dam on Pangula Farm, near Salisbury, which will enable him to almost double his irrigable area.

Water Requirements of Summer Crops.—The article in the last issue of the Journal on the relation between weather factors and maize yields is of great value, as it definitely establishes the importance of satisfying the moisture requirements of the plants during the latter end of February and early March, combined with bright sunshine during this period, in order to obtain bumper crops.

This ideal of course could best be obtained under irrigation, and it would be of value if definite experiments could be carried out to show the increased yields obtained by the artificial application of water to maize and other summer crops, during periods of drought, at the Matopo School of Agriculture. In any case, of course, it could not be claimed that it would be economical to instal irrigation schemes for the growth of summer crops in areas of fairly reliable rainfall, but the utilisation of existing irrigation facilities during partial drought periods might be worth while, and this of course becomes of more importance in our semi-arid regions.

In this connection the following extracts from Fortier's "Use of Water in Irrigation" are of interest, as showing current practice in America:—

"It has long been recognised that the artificial watering of crops in humid regions during drought periods results in increased yields. However, the cost of installing an irrigation system, coupled with the uncertainty as to how frequently it will be needed, has prevented anything like a general adoption of irrigation in such areas. The investigations conducted by Milo B. Williams for the office of Experiment Stations have demonstrated that the economic advantages of irrigation in the Atlantic Coast States should not be measured wholly by increased yields or a better quality of products. Under intensive farming, where large

sums are expended for fertilisers, waiting on rain before sowing the seed may prove very costly. The farmer who can moisten the soil by artificial means and plant a crop gains the advantage of having highly fertilised soil utilised without delay from dry weather. One of the greatest advantages of supplemental irrigation lies in the fact that irrigated crops with heavy yield and good quality can usually be marketed ahead of non-irrigated crops."

The following table showing the number of partial drought periods at representative stations in the humid region of the United States of America during ten growing seasons, as compared with conditions at Mazoe and Bulawayo, is of interest. The standard of partial drought in America is a consecutive period of 15 days or over with less than 1 inch of rain; our standard is more rigid, viz., a consecutive period of 10 days with less than 0.10 inch of rain on any one day during period November to March, so that if analysed on the American standard, our number of drought periods would be greater than shown in the table.

Station.	Average annual rainfall, inches.	Number of partial drought periods in ten seasons.	Number of days irrigation required.
Ames, Iowa	30.39	23	190
Oshkosh, Wisconsin	29.78	27	292
Vineland, New Jersey ...	47.47	46	352
Columbia, South Carolina	47.55	62	568
Selma, Alabama	50.75	60	724
Mazoe, S. Rhodesia	33.58	22	305
Bulawayo, S. Rhodesia	24.34	34	596

C. L. R.

The Army Worm.

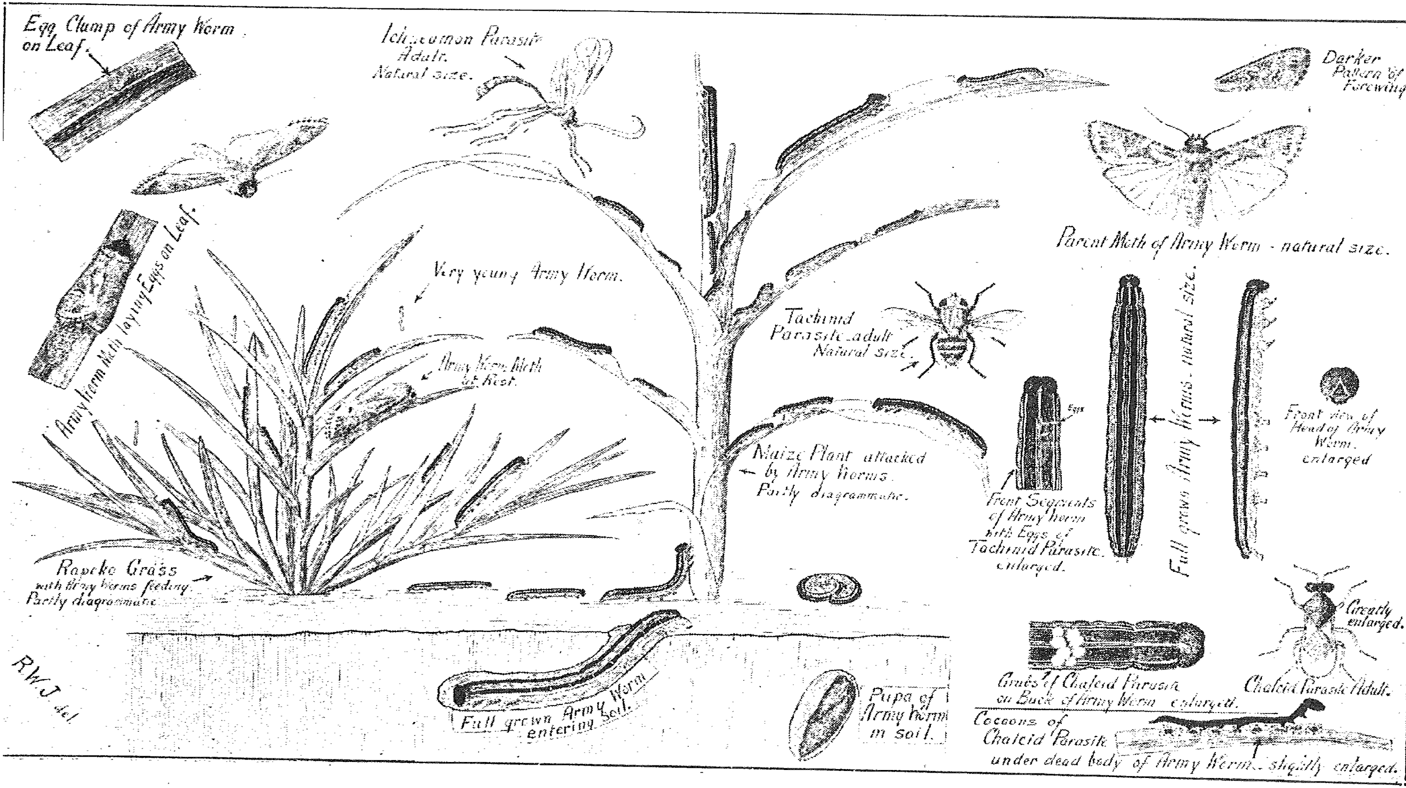
(*LAPHYGMA EXEMPTA*, WLK.)

(*Concluded.*)

By Rupert W. Jack, Chief Entomologist.

Origin of Outbreaks and General Remarks.—It is comparatively simple to grasp the process of oscillation of an insect between comparative scarcity and abundance under the influence of natural checks, but this particular insect appears to oscillate rapidly between great abundance and practical, if not complete, absence. The transition from one to the other is astoundingly abrupt, and the operation of known controlling factors does not appear adequately to explain it. Whenever outbreaks of the pest have occurred in the Colony, caterpillars have been collected in numbers in a nearly full-grown stage in the field. These caterpillars have yielded large numbers of moths in the insectary, and there is no doubt that vast numbers of moths emerged in the field. In actual fact the moths have been repeatedly observed in numbers, especially around light, during the period when cage breeding showed that they should have been on the wing. Yet no noticeable brood of caterpillars has followed in these localities. In a comparatively short time the moths disappear, and that is the end of the visitation for the time being.

Caterpillars of the recent outbreak, collected at Salisbury, yielded comparatively few parasites (certainly less than 20 per cent.) in comparison with the moths which appeared. It is not credible that the next generation of caterpillars could have been uniformly exterminated either by parasites or disease before they became visible, although, if the moths had laid eggs in the same locality as previously, the caterpillars might well have suffered very severely during this



The Army Worm (Laphyma exempta, Wlk.).

generation from parasite attack and been reduced eventually to comparatively small numbers.

A theory, which at least partially fits observed facts, is that the moths commonly migrate great distances before laying eggs. Such migrations, as in the case of the swarm locusts, may require the stimulus of great abundance before they occur. As the moths fly at night, they would hardly be observed in the act of flight.

The limited number of observations made in the insectary this season, indicating that the female moths do not attain sexual maturity as quickly as some allied species, is consistent with the idea of migration. The moths of the common cutworm (*Euxoa segetum*) lay freely within two days of emergence from the pupæ. The present species appears to require at least six days* and often considerably more. During six days of active life the moths could no doubt cover very great distances, as they appear to be comparatively strong fliers.

The distances insects may cover on the wing are not fully realised. Everyone knows, of course, that flying locusts may cover hundreds of miles in their migrations, but few realise that even such comparatively fragile insects as butterflies may cover similar distances. The white butterflies (*Catopsilia florella*, etc.), already referred to in this article, commonly keep flying steadily in a more or less south-westerly direction for weeks on end in the spring. The speed of flight is at least ten miles per hour, and flying eight hours during the day, a minimum of 80 miles per day would be covered. A six-days' flight would thus produce a migration of nearly 500 miles. If the moths of the army worm migrate, they might cover at least an equal distance as the butterflies in a similar period of time.

The question cannot, however, be regarded as decided. The great difficulty lies in ascertaining where the insects come from and where they go to. Little data are available concerning outbreaks in neighbouring States preceding and following outbreaks in this Colony, and it has not been found possible as yet to trace definite migrations of the insect.†

*Since the above was written, information has been received from the South Africa Union of eggs having been laid four days after the moth emerged from the pupa.

†Available records do not appear to lend support to any theory of migration between Southern Rhodesia and the South Africa Union.

All that can be said is that such meagre information as is available is not inconsistent with the theory of migration.

It is obvious that a migratory habit might be greatly to the benefit of the species, particularly in regard to shaking off the attentions of rapidly increasing parasites. Instinct might also lead the moths to seek the most favourable climate for the next brood of caterpillars in relation to the time of year. The brown locust, which normally frequents the drier parts of South Africa, gradually, in the course of a cycle of increase, spreads further and further afield, until the flying swarms in the dry season may invade and lay eggs in country which has a heavy rainfall in the wet season. A humid environment is, however, very conducive to spread of deadly disease in this species of locust, and it seems highly significant that as soon as the hoppers, which hatch with the first rains from the eggs laid by this species, obtain wings in such a climate as that of Southern Rhodesia or the Northern Transvaal, the winged swarms make all haste out of the country in a westerly or south-westerly direction, where a less humid environment is normally to be found. Fresh swarms may or may not invade the Colony from the west the following dry season.

It is to be noted that the caterpillars of the army worm have been met with in Salisbury on a number of occasions when no real outbreak has occurred during that particular season. These caterpillars might be the offspring of a comparatively few migrating moths, or it is possible that, under conditions which keep the insect from increasing unduly, generation may follow generation unobserved in the same locality. There are no data on which to form an opinion on this point.

The outstanding point is, however, abundantly clear, namely, that when vast numbers of caterpillars have occurred and produced myriads of moths in any given locality no comparable second generation has followed in the same locality, nor indeed in the Colony at all.* This has been

*The use of the adjective "comparable" is to be noted. Instances have occurred in which the caterpillars have appeared again in comparatively small numbers after an interval which would allow of their being the offspring of moths bred from the main outbreak in the same locality. Such occurrences are exceptional and have no bearing on the question of what becomes of the myriads of moths bred out from a general outbreak.

noted so many times that unless the moths do migrate great distances under these circumtances some very unusual explanation of the phenomenon must be still to seek.

CONTROL.

It is usually a very much easier task to write a section on methods of controlling an insect pest in an article or book than to advise farmers effectively when confronted with a statement of the actual position.

The literature concerning various species of army worm contains a great deal of information concerning methods of preventing the pest from invading cultivated lands after the "army" movement has appeared. It does not, however, give information of much practical value to a farmer who has found several hundreds of acres of maize infested throughout. Yet during the first stages of the outbreak at the beginning of the present year this was usually the position as stated by the farmer. Under such conditions the position undoubtedly seems rather hopeless.

Vigilance.—It was found, however, that, after the first alarm had sounded, the proportion of cases in which it was possible to give effective advice increased very considerably, due to the fact that farmers had been led by news of the outbreak to examine not only their maize lands, but the surrounding veld and land under fallow or crops other than maize. "Eternal vigilance is the price of safety." Even though vigilance may fail to save a crop already generally infested, the chances are certainly very much better if an infestation is noted in its earliest stages than if it remains unnoticed until appreciable damage to the crops calls the farmer's attention to "something wrong." In the case of a heavy infestation a crop of maize may disappear between Saturday and Monday, as, indeed, occurred in more than one instance during the recent outbreak. It is, however, practically certain that the caterpillars causing this disappearance would have been visible to a close investigator on these crops or on grass in the same lands for a week or more previous to this fatal week-end. Similarly, it is highly probable that losses could have been appreciably lessened had farmers generally possessed the necessary acquaintance with the appearance of the pest in its early stages and been on

the look-out for it between Christmas and the end of the year. Sporadic pests of this nature, capable of inflicting great damage within a short space of time, are particularly to be dreaded and watched for, on account of the fact that the period admitting of effective action is very limited.

Infested Crops.—As already mentioned, the main difficulty lies with crops which are more or less generally infested when the insect is noticed. It would be a considerable advance if some method of guarding against such infestation could be discovered. Without doubt in the great majority of such attacks the infestation commenced on the grass—mostly rapoko grass—on the lands, but a comparatively small amount of this grass appears to have sufficed. Moreover, there are well authenticated cases in which the eggs were clearly laid on the maize itself or on maize suckers. Apparently only small plants or small suckers attracted the female moths for this purpose. It would appear, therefore, that the cleanest cultivation may not be a complete safeguard against egg-laying on the lands, but as a general statement it does appear that it affords a considerably better chance of escaping attack, and perhaps safeguards the crop to an effective extent after the maize has attained a certain size. This size, unfortunately, cannot be accurately defined from available data. Rapoko grass is a weed which encourages several pests of maize, and no mistake can be made in making every effort to keep it and other weeds as thoroughly suppressed as possible. It is realised, however, that there is a limit to practicabilities in this direction.

Trap Crops.—A matter which calls for investigation is the possibility of utilising an attractive grass as a trap crop. Teff grass (*Eragrostis abyssinica*) seems to offer possibilities in this connection, but it is necessary to ascertain whether the attractiveness of this grass to egg-laying females is sufficiently strong to overcome the counter-attraction of rapoko and other grasses which may be growing in the lands. If army worm were an annual pest tests could readily be made, but effective tests are difficult in the case of pests which appear irregularly, sometimes at intervals of several years. The fact that the insect has so far tended to languish in confinement adds to the difficulty.

Lead Arsenate.—Many farmers have expressed disappointment at the lack of an effective spray which could be applied, without injury, directly to the maize plants and kill the caterpillars. The position in regard to this appears to be as follows, on the basis of existing data:—

The standard sprays for leaf-eating insects are insoluble compounds of arsenic, such as lead arsenate, Paris green (aceto-arsenite of copper), calcium arsenate, etc. Maize is, however, very susceptible to arsenical poisoning, and only the most stable and insoluble of these compounds can be applied with safety. This is lead arsenate. The very stability of this compound, however, makes it a slow acting poison, and caterpillars of any size do not succumb readily from eating foliage sprayed with it. Moreover, it seems to have some repellent action, and sprayed foliage is not readily eaten in quantity. This repellent action may be quite useful in protecting the plants actually sprayed, but it would appear necessary to spray the whole crop in order to secure effective protection. Another drawback lies in the fact that a uniform covering of the leaves of maize is not readily secured.

In experiments carried out at Salisbury, army worm caterpillars, continuously offered maize foliage sprayed with arsenate of lead powder 1 lb. in 25 gallons of water, fed freely for only about two days. The actual mortality was, however, low. A similar low mortality was recorded in an operation in the field, where 70 acres of maize were sprayed by means of power sprayers with arsenate of lead (powder) 1 lb. in 30 gallons of water, plus the requisite quantity of "spreader." The manager, in the latter case, was inclined to regard the application as a failure, but this is questionable. An entomologist, who examined the field five days after spraying, recorded that the vast majority of the caterpillars appeared sick and were not feeding.

The cost of applying lead arsenate to a field of maize is not prohibitive. This insecticide can be bought in quantity in Salisbury at about 1s. 3d. per lb., and with the power sprayer mentioned above, the quantity of liquid used for ten acres was reported at the low figure of 250 gallons, the cost for material at 1 lb. in 25 gallons being thus 1s. 3d. per acre. The practical point is, however, that power sprayers are

necessary to cover any considerable acreage of maize and that these are only available in very exceptional instances.

Further tests with lead arsenate are certainly needed, but it would seem that under existing conditions its low killing power is a great drawback in reference to effective use. If it could be used over infested patches of limited extent to prevent spread of the pest, or if, say, a dozen sprayed rows on the outside would protect a crop from invasion, it would be decidedly useful, but the probability appears to be that the insects would leave the sprayed plants more or less alone and move off to the unsprayed parts of the field. In any case, uncertainty as to its exact effect on the caterpillars makes it undesirable to recommend its use to the farmers. Experience in the Union of South Africa also appears to be discouraging in reference to control of army worm with this insecticide.

Contact Sprays.—Experiments have been carried out from time to time with contact sprays, other than those containing soluble arsenic, against this pest, but the results have been discouraging. Sprays tested have included paraffin emulsion (stock solution, diluted 1 : 9), nicotine sulphate (40 per cent., diluted 1 : 1,000, plus 1 oz. soft soap per gallon) and a miscible oil (3 : 100). Hairy caterpillars are readily killed by paraffin emulsion, but the smooth army worm caterpillars are little affected. The other applications were also ineffective.

Mechanical Destruction.—Many small crops were saved during the recent outbreak by sending native labourers through the fields to destroy the caterpillars in one way or another. The caterpillars have been shaken off the plants and the natives have crushed them on the soil, either with some suitable implement, such as a short piece of plank, or, not infrequently, with their feet. Using short planks and doing the work very thoroughly, it was found that one native required four days to clean up an acre. Practical farmers, however, reported much benefit from less thorough methods, the natives working through rapidly, destroying the bulk of the fallen caterpillars with their feet and not aiming at anything approaching a 100 per cent. kill.

Use of harrows, brush drags, etc., on the crops did not appear to produce much benefit and was apt to cause considerable direct injury to the crops.

One method which might be worth testing lies in the use of an arch cultivator fitted with discs or shovels, in such a way as to hill up the rows. A piccanin could precede the implement to disturb the plants and cause the caterpillars to fall to the ground, or a bush could be fixed for the same purpose in front of the cultivator. A large proportion of the caterpillars should be buried by this procedure if the soil is in good tilth. There has been no opportunity of testing this method in the field, but laboratory experiments in burying the caterpillars under one, two and three inches of loose, dry soil gave the result that the majority of those so buried failed to reach the surface, results, as might be expected, being better with caterpillars of smaller size. It is particularly to be noted that the Entomological Branch is not in a position definitely to recommend this procedure. Thorough field tests are necessary. It is merely put forward as a suggestion in case any farmer during the next outbreak cares to try it. It cannot be tested in the meantime.

Poison Baits.—A method developed by the farmers in one district during a local outbreak a few years ago was the use of the lower leaves and suckers of maize, available coarse grass, etc., dipped in arsenite of soda solution (locust poison, 1:200, or arsenite of soda 1 lb. in 20 gallons of water). The bait was strewn along the rows near to, but not touching the growing plants, and the latter were immediately disturbed to make the caterpillars fall. A considerable proportion was stated to have been poisoned before regaining the plants. It is judged that the bait is only effective as long as it remains moist. The addition of two gallons of molasses to each ten gallons of the dilute solution might help to keep the bait wet longer, but experiments to date have not revealed any actual attraction exercised by either sugar or molasses on the caterpillars. Possibly they drink more greedily of the sweetened solution than of the plain solution, but they readily poison themselves with the plain solution. This method is decidedly laborious and gives only a moderate return for labour expended.

Use of Poison on Grass in Lands.—It is a common position for the caterpillars to be confined temporarily to the grass between the rows of maize in the lands. These caterpillars can be killed readily enough with arsenite of soda solution, and the death of the grass is desirable in any case. The difficulty is to wet the grass without wetting the maize. This is not at all easily accomplished with a spray pump, and the procedure has been considered too dangerous with these machines in the hands of natives. Watering cans naturally suggest themselves, and some farmers report having used these to good effect. Their small capacity and the labour and difficulty of constantly refilling them are very great drawbacks. Their use between rows of maize calls for the greatest care, as the solution is deadly to any green plants which become wetted with it.

PROTECTION OF CROPS FROM INVASION AND PREVENTION OF SPREAD.

Protection of crops from invasion by caterpillars generated elsewhere is an eminently feasible undertaking, and good work in this connection was carried out during the recent outbreak. The methods used are also in many instances applicable to prevention of spread of the pest in a maize field already partially infested.

Arsenite of Soda Solution.—The locust poison distributed during the recent outbreak is a plain solution of arsenite of soda (80 per cent.), consisting of 10½ lbs. of arsenite of soda dissolved in each gallon of water. This concentrated solution is diluted for use with 200 times its bulk of water, roughly 3 fluid ozs. (6 tablespoonfuls) to a petrol tin of water. Whilst during the early part of the outbreak reliable information was lacking as to the effect of this solution on the caterpillars when used as a plain contact poison—that is, apart from being drunk by the insects—experience soon demonstrated that it killed quickly and surely when it wetted the caterpillars, even though these were on a dry, absorbent surface, such as bare soil, which did not afford them opportunity of drinking the liquid. Following assurance to this effect, cattle dip, which is also a solution of arsenite of soda, usually with a certain quantity of tar products and soap added, was also used to good effect. The

amount of arsenite of soda in a gallon of 1 : 400 cattle dip is less than that in a gallon of locust poison, and the dilution recommended was therefore about 4 ozs. (8 tablespoonfuls) in a petrol tin of water. No hesitation need be felt in using cattle dip in emergency, for, although cattle dip may fail as a bait on account of the distasteful ingredients contained, the greatest execution, as in the case of locust destruction, is in practice inflicted by contact spraying.

Infested grass near maize lands can be sprayed with the poison and the caterpillars so destroyed. Badly infested patches of limited extent in a maize land can be sacrificed to prevent further spread of the pest if no other method of cleaning them up can be adopted. Wherever caterpillars are numerous in a position to be sprayed without injuring growing crops, the poison can be used to good effect.

It is, however, in conjunction with defensive trenches and furrows that the poison can be used with the greatest safety and economy.

Defensive Trenches and Furrows.—Probably the most effective type of protective furrow is that known in the United States of America as a dust furrow, but as army worm outbreaks in Southern Rhodesia occur during the wet season it is not necessary to describe the method of construction here. Actually, however, the weather was dry during the recent outbreak, and at the Experiment Station, Salisbury, a ridge of finely sifted soil was used by the manager as an addition to a trench for a short period, and it was interesting to watch the futile attempts of the army caterpillars to scale the side, which made an incline of about 50 degrees with the surface of the soil. A fall of rain, of course, makes such a protection of very little value.

A useful form of trench is about 18 inches deep, with a perpendicular or undercut side towards the crop to be protected. There may be some slight advantage in having both sides perpendicular, for reasons which will appear later. Post holes two feet or so in depth can be sunk at the bottom of the trench at frequent intervals and help to concentrate the caterpillars. A farmer who constructed such a trench informed the writer that not only was the bottom of the trench entirely hidden under a writhing mass of caterpillars, but that every post hole was full to overflowing.

Methods of constructing such trenches vary with the implements available on any particular farm. The trenches are usually roughed out with more or less suitable animal-drawn implements and are then completed with hand labour. A Martin "Ditcher" is amongst the most suitable implements, but single-furrow mouldboard ploughs and even ridging ploughs were used to good effect.

Where the arsenical spray is being employed it is hardly necessary to sink post holes. A common practice has been to pull up the outer rows of the maize plants and to strew these along the bottom of the trench, then to give them a good wetting with the poison. It is well to avoid being too lavish with the plants to begin with, as, if the fight is at all prolonged, several renewals of the greenstuff may be necessary. Coarse grass can be used instead of maize. At the bottom of a trench the poison keeps moist considerably longer than it would exposed to sun and wind on the surface, and the value of steep walls to the trench on both sides in affording maximum protection to the poison from the sun is clear. As long as the poison is moist the caterpillars tend to suck it up, irrespective of the nature of the surface on which it rests; moreover, the caterpillars tend to become wetted in crawling over the moist surface. Experience has shown that caterpillars falling into such a trench do not always leave it readily, and it has been suggested that the comparatively cool conditions at the bottom of the trench tend to make them sluggish. They also tend to crawl under the shelter of the leaves when the sun is shining into the trench, and here again they tend to come into contact with the poisonous solution, which remains moist for a considerable time on the undersides of the leaves and stalks.

From the mechanical standpoint a hard-walled trench is not an insurmountable barrier to the caterpillars, but it checks them for a considerable time and causes them to concentrate. It is necessary, therefore, to watch the trench and to use the spray pump when and where necessary.

One point on which further information is needed is whether the caterpillars continue marching at night. Observations made at Salisbury during the recent outbreak and reports from farmers and others concerned with the pest have all indicated that marching stops at night, with the inference

that the trenches can be left at sundown and need no further attention until sunrise. This has in general been the practice. More observations are, however, necessary before this cessation of activity at night can be regarded as an established fact, and farmers will be best advised to make their own observations in this connection. If this is the regular habit of the insect, it is certainly a very convenient one from the farmers' point of view.

When it has been inconvenient to construct a proper trench, or available labour has been insufficient, or action has had to be taken in a great hurry, a number of ordinary rough furrows have frequently been interposed between the crop and the advancing menace. These have the effect of checking the speed of the vanguard and causing a concentration of the caterpillars, thus admitting of good work with the spray pumps. Reports are to the effect that this method is reasonably effective, the caterpillars apparently becoming confused and checked on the rough ground.

Methods used to protect crops can, as already stated, generally be used to isolate infested patches in the maize field, although the question of damage by trampling needs to be taken into consideration in using implements drawn by oxen. In the case of infested patches of limited extent it would appear most economical to sacrifice them and kill the caterpillars by spraying with arsenite of soda solution or cattle dip.

Mechanical Destruction in Defence.—Mechanical measures which give poor results on ploughed ground and damage the crop may be used to better effect on comparatively smooth uncultivated ground. A roadway offers the best opportunity in this connection. Implements used include harrows turned upside down and interwoven with branches, bunches of trek chains, trek chains looped behind the cross bars of a harrow, brush drags, consisting of bushes secured to a cross bar and weighted down, and other devices which will suggest themselves to the practical farmer. Such methods may be used in emergency, but entail constant labour and are inferior to the combination of furrows or trenches with the spray pump and arsenical solution.

WARNING.

The poisonous nature of arsenite of soda must never be overlooked when employing it as an insecticide. It has apparently a saline taste, which herbivorous animals find pleasant. Not only will cattle, mules, etc., lick up the dry powder like salt, but they are liable also to lick up soil saturated with the solution. Moreover, they drink the liquid readily, and freely graze sprayed pasture. *Stock should be kept away from sprayed pasture until a good washing shower of rain has fallen.* Ground should not be allowed to become saturated with the liquid, an accident which is most likely to occur where vessels are being filled. Open vessels containing the liquid should not be allowed to remain unguarded. In other words, ordinary commonsense precautions need carefully to be observed.

New information contained in the foregoing article has been accumulated in collaboration by the technical officers of the Entomological Branch, including Mr. J. K. Chorley, Mr. A. Cuthbertson and the writer. Mr. Cuthbertson has been in charge of the breeding work in the insectary. Mr. S. D. Timson, of the Agricultural Branch, contributed valuable observations bearing on the question of recovery of maize plants after injury.

Making a Garden in Rhodesia.

HINTS FOR BEGINNERS AND NEWCOMERS.

(*Continued.*)

By Mrs. E. M. V. Carnegie.

Climbers.—There is usually room for a porch or two in the garden, and possibly a pergola, and in this country of verandahs we all have some sort of place for climbing plants. Fortunately there are quite a number that do extraordinarily well and very soon cover the space where they are wanted. Of course, in the towns or near by, it is possible to buy porches and pergolas ready-made, but for those who make gardens on the edge of beyond things are not quite so simple.

If your porch is to be home-made, the standards, at all events, must be of iron, to withstand the ravages of the white ant. It is sheer waste of time to put in wood and hope for the best. There is no best where the termite is concerned. Piping can usually be easily procured and does excellently, for if you can only get short lengths just for the bottom part, the rest can be made of wood, the uprights being stuck into the piping with cement. In many parts of Northern Rhodesia the bamboo is a great asset, and lends itself to all sorts of garden requirements. It is light and strong and makes excellent fences, porches, stakes, etc. Wire netting is also extremely useful in this direction, stretched edgeways between two posts.

An excellent plan for shading a stoep without shutting out the air is to make a screen of wire netting and piping about three feet away and cover it with creepers. Such a screen covered with *Bignonia venusta* (Golden Shower) or *Antiginon leptopus*, a lovely coral pink creeper that is

covered with masses of bloom for eight or nine months at a time, is a sight not easily forgotten. Both these creepers have the advantage of being evergreen and not too dense in growth. All the *Bignonias* are lovely, and although the Golden Shower is rather slow at first, the others grow fairly quickly, especially *B. tweediana*, which has a small leaf and quantities of yellow flowers. *Bignonia Chamberlaini* is cream with yellow throat. It grows quite freely and sends out long shoots, which root at every joint if allowed to run over the ground. Another *Bignonia—Speciosa*—has a mauve flower and small leaves, and is a very dainty thing. They all grow well, either on porches or over a building, and require very little attention beyond being kept in their places.

Bougainvillea everyone knows, and though it is difficult to strike and slow to get going, it quickly makes strong shoots once it starts. There are three kinds—the magenta-purple, which is the commonest, a red and a terra cotta. The first is a glowing mass of colour, clashing with everything else and very typical of the country. The other two are much softer-toned and prettier, but seem somehow to have lost the Bougainvillea character. The terra cotta one is lovely trained on a white wall. There is one on the "Monastery" wall at Sea Point, which arrests attention at once. The magenta one is rather too heavy for porches, but makes an excellent hedge, as it will stand any amount of pruning and trimming. It can be grown also as a bush or trained over an outbuilding, and it has been used to form a complete summer house, though this is rather risky, as it is supposed to be a favourite hiding place for snakes.

A good climber for training on or near a verandah is the Shell Creeper (*Phaseolus caracalla*). It grows very quickly and produces numbers of flowers like the inside of a shell, which have a very sweet scent.

Another well-known one is Dutchman's Pipe, so called from the shape of the unopened buds. This is *Aristolochia elegans*, and it has a relative called *A. ugas*, with a much larger flower. They are both evergreen and very striking with their heavily-veined and velvety flowers.

Three good white-flowered climbers are Beaumontia, Stephanotis and Mandevillea. The latter likes a wall to lean on.

A useful climber that can also be grown as a "weeping" shrub is Cryptostegia. It grows quickly from seed and has very pretty mauve and white funnel-shaped flowers.

For a light porch or trellis Mannetia Bicolour would be very suitable. It has light foliage and red and yellow flowers.

Then there are several different kinds of honeysuckle which all grow very readily. The English one keeps its sweetness and takes one straight back to the lanes and hedges. The Japanese variety is yellow, but not so sweet-scented nor so free-blooming. The Kaffir honeysuckle is red, and there is another variety known as the Bush honeysuckle, or, by a more high-sounding appellation, *Lonicera gigantea superba*!

The Passion Flowers grow very quickly and luxuriantly, and for that reason would probably be better on stout fences or pergolas. The Granadilla is the best known one, and is grown for its perfectly delicious fruit, tasting like a cross between a strawberry and a very ripe black currant. The purple Passion Flower (*Passiflora coccinea*) and the scarlet-flowered variety (*Tacsonia volxemi*) are both far more beautiful, and would be wonderful grown one on each side of an archway.

There are three kinds of Potato Creeper, a white, a pale blue and a mauve—all sturdy growers—and the pale blue one especially beautiful, or seeming so, because there are not so very many blue climbers. *Petrea volutalis* is one of them and is easily grown. It has flowers of a dark shade of saxe blue.

Ipomea or Heavenly Blue Convolvulus is another, and is very well worth growing, for it covers itself with large, beautiful blue trumpet-shaped flowers, and simply revels in the sunshine. It is an annual, but scatters its seeds broadcast and cheerfully comes up again year after year. There is perhaps not another such showy climber in the whole list, and the patch of colour it makes against a dark background is wonderful. All the convolvulus family grow very easily and deserve a place in the garden, though they are more satisfactory if planted near some perennial climber, so that when they die down there is no gap. The Moonflower is a

convolvulus with large white flowers which open at dusk and fill the air with fragrance like that of the night-scented stock.

Cobea scandens is a rather heavy creeper with bell-like flowers that are first green and then mauve. It would look well grown with something very light, like *Mina lobata* or the Cardinal Climber. The former is an annual, with spikes of flowers growing in pairs from every leaf base all along the stem, red and yellow-like flames—a very pretty thing, and a great contrast to *Cobea*. The Cardinal Climber would be equally effective, as it has the most delicate, finely-cut foliage, like long sprays of fern, and starry red flowers all over it. This is an annual too, but reproduces itself with little or no encouragement and is very well worth having, though it is not dense enough to grow by itself.

The Canary Creeper is another annual, very pretty and bright yellow—a rather unusual colour—but rather delicate. It should have a sheltered spot and a climber with more "body" to lean on.

The Zimbabwe Creeper, Wistaria and Pueraria all have mauve flowers, the last-named growing very freely. It is sometimes called "Jack and the Bean Stalk" from its rapid growth, and is probably at its best climbing over a building. It has large masses of pea-shaped flowers of a rather dark shade of mauve.

There are also the Tecomas—each wonderful. *Tecoma grandiflora* is a glorious sight when in bloom, with masses of large orange-coloured flowers and shining leaves. *Tecoma jasminoides* has red and white blossoms and is a very dainty creeper, as is also its sister, *Tecoma Australis*.

There seems almost an unlimited choice, for besides these, which have all been tried and found suitable for Rhodesia, there are many others, and all the climbing roses, so there should really be no difficulty in covering porches and trellises of whatever size and situation. The difficulty indeed seems to be which to choose out of so many. Some we must have, for a porch or pillar or pergola does make an "incident" in the garden and relieve it from flatness, and is a very great asset judiciously placed.

About the planting of them. Annual climber seeds should be sown in boxes about August or September and

transplanted to their permanent place in the garden as soon as they show about six or eight leaves. They will flower for eight or nine months if given a little encouragement in the form of manure water once a week and a frequent taking off of all dead flowers and seed pods. The soil round the roots should be constantly loosened and dug over, and a sharp look-out kept for the white ant. A little Epsom salts dug round the root helps to keep the enemy off and does not hurt the plant.

The perennials should be sown in the autumn and planted out in early spring, when all chance of frost has gone. In July or August they should all be pruned back and tied to their supports, dead wood taken away and any branches that seem to be overcrowding others cut off, to leave room for the new shoots that will be appearing in September. In some parts spring comes a week or two earlier, and pruning must be done accordingly. It is easy to see when the new buds are swelling—that is, the leaf buds—and as soon as the first sign of rising sap appears pruning should begin.

Shrubs.—Flowering shrubs are most satisfactory things to grow, and can be used with great advantage even in a small garden. They are pretty at the corner of a flower bed or in the lawn, and, carefully placed, will often hide an ugly spot or shut out an undesirable view. They can be used as a hedge too, and some are more suited for this than for planting singly, especially the bushy, compact-growing, evergreen ones.

Plumbago is ideal for hedging, as anyone will agree who has seen the hedge in full bloom at the manager's home on the Globe and Phoenix Mine. There is such a riot of colour at that corner—yellow, red, pink, magenta, mauve and blue all in flower at the same time, and so evidently rejoicing in the Rhodesian sunshine that it makes one glad to be alive. If an artist could reproduce it he would never be believed, except by those who had actually seen it.

The yellow is the flower of the Silver Oak, which is not a shrub but a fast-growing evergreen tree; the red and the pink different varieties of Hibiscus; the magenta, the familiar Bougainvillea, while Jacaranda supplies the mauve and the Plumbago hedge the blue. As a background there are numerous shades of green, and quite probably there are

other colours as well. Such a massing of shrubs and trees is glorious, but not many small gardens would have room for them all.

To go back to the *Plumbago*. There are two kinds, both indigenous and very hardy. The saxe blue one is *P. capensis* and the lesser known variety *Plumbago larpentæ*. This is dark blue and is familiar to those who live north of the Zambesi, as it grows on almost every ant hill and transplants well.

There are many kinds of *Hibiscus* and they are all evergreen and most of them suitable for either massing or growing singly. As a rule the double-flowered shrubs are more compact in growth than the single varieties and therefore more suitable for hedges. The single ones are: *Hibiscus carmine,* *Hibiscus zeyheri* (orange), *Hibiscus sinensis S.* (pink), *Hibiscus sinensis* (orange), *Hibiscus syriacus S.* (mauve), *Hibiscus mutabilis* (white). The white one turns pink as the flower fades at the end of the day, and has a rather smaller bloom than the coloured ones. There is also a single red one with crinkly petals and a very long pistil, very pretty but rather deficient in the matter of foliage. The double ones are *Hibiscus syriacus* (white and mauve) and *Hibiscus sinensis*, with brilliant scarlet double flowers and dark green shining leaves, a very sturdy shrub and splendid for filling a corner.

The *Cassia* is indigenous and grows very quickly into a fine bushy shrub, which is covered with masses of yellow flowers, just at the time when flowers are scarce.

If you want to see *Poinsettia* at its best, grow it at the foot of a beefwood tree, or some dark leaved shrub that is evergreen. This applies specially to the scarlet variety, but also to the pink and yellow. The flowers last a long time in water if the stalks are first burnt at the end.

Duranta plumieri is a very pretty dark green shrub with masses of pale blue flowers like forget-me-nots, followed by clusters of yellow berries.

There is also a white *Duranta*, just as attractive and free flowering.

If you want to cover a large space or an ugly bit of wall, try the terra cotta *Bauhinia*. It is an indigenous

shrub and accustomed to sprawl, so give it plenty of room. In a very little time it will have turned the ugly spot into a blaze of glory, for it has almost as many flowers as leaves, shaped something like a Nasturtium, and bright terra cotta red. It needs to be seen to be properly appreciated. There is also a mauve one—very sweet scented—and a white. The white you can seen on the way to the Falls and everywhere beyond, with crinkled and curly flowers like orchids.

Another shrub from the Zambesi Valley is the *Lassiandra*. This needs a rather sheltered position, as it cannot stand much frost. It is worth taking care of, for it has large rich purple flowers and soft downy leaves, which turn orange and scarlet in the winter.

These brilliant foliaged plants should have a place in every garden, as they provide colour when colour is scarce.

Alstonia is another of them and is lovely at all times, for when in bloom it has large loose bunches of jasmine-like white flowers, and as soon as these are finished all the shining green leaves turn red and gold, clothing the tree in beauty till the new green comes again.

A favourite shrub where there is plenty of room is Frangipani. It is a quick grower and always in bloom. There are three kinds, the cream with yellow centre, which is best known, a pink and a terra cotta shade. The flowers have a lovely scent and can be used for the house by putting each one separately on to a stalk of grass, when they look like lilies, specially if mixed with grass foliage.

Azaleas and *Oleanders* take very kindly to Rhodesian conditions and there are several varieties of both, red, pink, white and mauve, which all bloom freely and remain in flower a long time.

The lemon scented *Verbena* is easy to grow and the leaves are said to keep away mosquitoes. They may or they may not, but in any case they are very refreshingly fragrant and worth growing if only for the potpourri jar.

One of the very nicest shrubs for a hedge is the scarlet Bottlebrush (*Calistemon coccineua*), and it is equally suitable to stand alone. It is evergreen, very graceful, and covered with scarlet flowers in the shape of a bottlebrush, which

seem to attract the loveliest birds in the garden, making it doubly beautiful. If grown as a hedge, it is better to top it and keep it fairly low and shrubby, watering it well in dry weather. Fortunately the white ant does not seem to care for it—an additional advantage. If kept to about eight feet in height, it makes a complete screen in about two years from seed and a year from the time it is usually got from a florist or nurseryman.

Buddleias grow rapidly and can be had in two varieties, a yellow-flowered and a purple. The foliage is grey green and very pretty until it is discovered by a particular species of butterfly, which chooses it whenever possible as a nursery for thousands of little caterpillars, when it ceases to look attractive.

Lantana is a very gay fellow, flaunting a robe of red and yellow velvet, which is very brilliant in the sunshine. He comes of a fairly large family, having pink and yellow, white, and yellow relatives, and also a dwarf connection, *Lantana salviæfolia*, which has mauve, verbena-like flowers continually in bloom. This is a splendid little shrub for the corner of a border, for it is compact in growth and evergreen.

There are two *Holmskioldias*, one with terra cotta flowers and one with yellow, or rather yellow and green. They are somewhat sprawly and should be put at the back of a border or in a spot devoted to shrubs only. The flowers grow all along the stem and the branches are fine for cutting.

Datura is the white moonflower, quite distinct from the convolvulus type of moonflower. It is a fairly large shrub, with huge white flowers like bells, which are very beautiful, very sweet-scented and very poisonous. It has a yellow cousin with the same properties.

The *Poincianas* are all lovely and show to greatest advantage standing alone on a lawn or in a bed. *Poinciana pulcherrima* has red and yellow flowers growing in spikes something like the flower of the horse chestnut, but much looser and lighter looking, the stamens standing upright about three to four inches above the petals. The foliage is very ornamental, rather like a broad acacia leaf. *Poinciana aurea* is a yellow variety with long red stamens; *Poinciana gilesii*, a red one, called the Bird of Paradise flower, and *Poinciana regia*, another red, with leaves growing flatly like a cedar tree and generally known as the Flamboyant.

Another charming shrub for growing singly is *Streptosolen.* It is very hardy and evergreen and produces masses of small orange-coloured flowers.

There are five or six varieties of *Philadelphus* or *Syringa.* This is not the tree with lilac-like flowers so well known in Africa, but the shrub that is often called mock orange, having flowers very much like the orange tree in shape, colour and scent. It is deciduous, so should be planted amongst shrubs that are evergreen.

Tecomas grow very quickly and form a splendid hedge, always full of big trusses of bright yellow flowers. There are two kinds, *Tecoma Smithii* and *Tecoma Stans,* the first-named being yellow and red and having rather darker green foliage than *Tecoma Stans.*

For making a light hedge *Parkinsonia* is ideal. It is a fairy-like shrub with trunk and branches always green, not brown, fine fern-like foliage and dainty yellow flowers. It also has very sharp thorns. It grows readily from seed, which should be soaked in hot water a day or two before planting.

There are, of course, very many more that have not been mentioned and which would probably do equally well in this country, and in addition to all these there are quite a number of flowering bushes in the veld which might with great advantage be grown in our gardens.

All deciduous shrubs should be pruned when their leaves have fallen and evergreen ones in June or July, or just before the sap begins to rise. Some are earlier than others and must be watched and pruned at the proper time. About May or June the soil should be loosened and a good layer of manure dug in around their roots, and they should have a good soaking with water once a fortnight at least all through the dry weather.

Practically all shrubs will grow from cuttings and produce a good-sized plant very much more quickly than if grown from seed, though a more satisfactory way to obtain them is to go to a nursery and pick and choose, getting advice at the same time as to how and where to grow them.

(To be continued.)

[The next instalment of this series of articles will deal with the kitchen garden.—Ed.]

Dairying in Southern Rhodesia.

OBVIOUS DEFECTS IN FARM BUTTERS AT OUR SHOWS.

By F. A. LAMMAS, D.D., Dairy Officer.

There is perhaps nothing so displeasing to the eye of the discerning public as that of an exhibit of 20 lbs. or 30 lbs. of butter of varying shades on a show. Possibly, very pale butter may lose none of its food value and in all other respects may be superior to a pound by its side delicately coloured; yet in nine cases out of ten the buyer will choose the coloured sample for preference.

It should be remembered that the public bases its evaluation of quality on the butter supplied during the spring and summer months, and when in the winter, due to lack of green and succulent feeds, the colour becomes pale, the general opinion is that the standard has been lowered and another supplier is looked for.

Dairying in this Colony is no longer a mere side line; to many it has become the most important branch of farming, and for this reason a standard quality and colour should be aimed at. To achieve this, provision must be made for the feeding of green fodder during the lean months.

In all fairness, it cannot be said that the general run of farm butters on the shows this year were tastefully displayed; few of the pounds were correctly and neatly wrapped. This may only be a minor point, and many argue that it is the article inside the package that counts; be that as it may. The shopkeeper, however, tells us that an article neatly wrapped and tastefully displayed will always sell best, even though the quality be poor.

On the butter score-card, five marks are allotted to finish and general appearance. Few samples gained full points; usually a deduction of a single point was made, and in quite a number as much as $2\frac{1}{2}$ points. Deduction of one point is seemingly not great and would only bring down the score of a perfect butter from 100 per cent. to 99 per cent.; but when considering the five points allotted to finish as a percentage, a deduction of one mark would actually mean 20 per cent.

During the summer months, owing to the great heat, the desired finish and general appearance is not always obtained, but certainly during winter, when the shows are held, there is little excuse for butter that does not obtain full marks on this count.

However, the most outstanding defect in the exhibits was that of flavour; few samples were of the delicate, creamy, nutty flavour so desirable, the majority being insipid or "flat." This is due to the lack of green feeds, and once again the necessity for making necessary provision is emphasised. Butter which lacks flavour, being free from objectionable taints, is termed "flat" or insipid.

Amongst the causes of this defect may be mentioned the following:—

(1) Lack of green and succulent feeds.

(2) Insufficient ripening of the cream or ripening at low temperature.

(3) Excessive washing of the butter when in the granular stage.

(4) Addition of insufficient salt.

Cream during the winter should be churned at least twice a week, and for preference every third day. To aid the growth of lactic acid so necessary in churning and flavour, especially when no starter is added to assist in ripening, the cream should be ripened in a clean atmosphere at an even temperature of 70 degrees Fahrenheit.

As stated, "flat" condition may also be due to excessive washing of the butter whilst in the granular stage. Cold water has the effect of absorbing these delicate flavours, leaving the butter flavourless.

Occasionally, butter is "flat" simply because it is undersalted. The use of a little more salt often brings out the flavour much better.

A few samples at the shows were gritty—though happily very few. In this respect, brine salting is advocated, especially when the butter is intended for show purposes. One pound of salt dissolved in one gallon of water will have the desired effect if the butter grains are allowed to remain in the solution from fifteen to twenty minutes.

It is worthy of note that 99 per cent. of the butters exhibited—though lacking in flavour—were not in any way tainted. One sample, however, had a very pronounced taint of Kerol. Special mention should be made here of keeping all disinfectants and goods liable to taint the cream and butter as far away from the dairy as possible.

The afore-mentioned case was merely one of cleanliness. The farmer had scoured the milk buckets with Kerol with the idea of getting them scrupulously clean.

It must be emphasised that dairy utensils should be cleaned with water only, for soaps and disinfectants are in no way suitable.

On the whole, the exhibits at all the shows were very commendable, the general standard of quality being good. Greater keenness, however, could be shown in exhibiting, and the writer would urge all dairy farmers to make a point of competing at the local Show.

Empire Buying a Growing Habit in the United Kingdom.

PROGRESS OF THE EMPIRE MARKETING BOARD. A HOPEFUL OUTLOOK.

Remarkable evidence of the growth of Empire buying in the United Kingdom is given in the annual report of the Empire Marketing Board, which covers the year ended May, 1930, and which has just been published.

Attention was drawn in the last annual report of the Empire Marketing Board to a number of Empire-grown foodstuffs, shipments of which into the United Kingdom had surpassed all previous records in 1927 and 1928. The list was long and comprehensive. In spite of this, the year now under review showed further evidence of progress in the consumption of Empire produce in the United Kingdom. Some foodstuffs, record shipments of which were noted in the last report, arrived in even greater quantities, while other commodities established records. Fruits, dairy produce, tea, meat, sugar and wines are included in the list of records.

Purpose of the Board.—The purpose of the Empire Marketing Board is clear and definite. It is to improve the quality and increase the quantity of Empire products marketed in the United Kingdom and to make Empire buying a national habit. From this centre radiate all the diverse activities of the Board. The scientist at his laboratory table serves its central purpose no less than does the salesman at his shop counter. For modern marketing is an enormously complex machine, and, unless every cog of it is in smooth running order, the perfection of many isolated parts is without value. It is a commonplace to say that no advertising, however skilful, will sell poor goods. Even if the advertising and the quality are beyond reproach,

marketing will still fail unless the many problems of distribution have been studied and solved.

The Board aims at seeing that no factor contributory to the growth of Empire marketing is neglected. The public of the United Kingdom has been approached from many angles. There is first the need for making a busy, island, industrial people aware of the realities of the scattered Empire of which they are citizens. Such educational publicity can neither achieve its objects swiftly nor have an immediate and measurable effect upon sales. Nevertheless, if the habit of Empire buying is to be permanently established, educational publicity is essential. The more vividly people appreciate the achievements, the possibilities and the needs of the Dominions and Colonies, the more naturally will they choose to do their business within the Empire.

Catering for the Consumer.—But other approaches to the consumer had equally to be explored. Here again is a complex problem. The active sympathy of the great corporate bodies, powerful as purchasers of raw materials and foodstuffs in bulk, has been sought by the Board. Individually so weak in comparison with these bodies, but collectively even more effective, are the housewives, whose goodwill the Board has taken every opportunity of enlisting. The diversity of consumers in the United Kingdom goes far beyond these broad differences. Varying standards of wealth present another problem. Local habits have had to be taken into account. It is a mistake to suppose that easy communications have broken down the barriers behind which the various regions of the United Kingdom still lead distinctive lives. What London likes may prove to be what Lancashire refuses. The exporter from the oversea Empire who means to serve a nation-wide market with his goods has to study the distinctive taste of districts.

No amount of persuasion brought to bear upon the consuming public in all its forms would succeed unless it was supported by the wholesale and retail traders. The Board has accordingly endeavoured to secure the fullest co-operation of all kinds of traders concerned with Empire marketing. The Board's officers seek to work in close daily touch with the trades, and this annual report would be misleading if

it failed to bring out emphatically the value of the services rendered by the trades to the cause of Empire marketing.

The Empire's Marvellous Strength.—Behind all approaches to traders and consumers stretch the innumerable fascinating problems of production and transport. The Empire as a productive entity is young. New sources of wealth are being opened up every year. The Empire is scattered about the world. These facts give it a marvellous economic strength, enabling it to grow almost every kind of natural product. But the need of patient attention to every link in the chain between prairie and fruit farm, ranch and plantation and the retail shops of the United Kingdom is thereby vastly increased. It is natural that the Board should have been invited to lend its aid in many and in contrasted activities. The Board has reviewed all applications with the sense which four years' work has given it of the complexity and of the seeming remoteness of many factors which bear ultimately upon the sale of Empire produce in the United Kingdom. A bull shipped to one part of the oversea Empire and an insect to another may each in its own way do a service to Empire marketing.

The detailed sections of this report should, then, be read in the light of this diversity which gives such scope for service to all citizens of the Empire and at the same time affords the strongest grounds for optimism as to the issue of their endeavours.

Change of Government.—The change of Government after the general election in May, 1929, led to alterations in the political membership of the Board and of its committees. Lord Passfield, the new Secretary of State for Dominion Affairs and for the Colonies, succeeded Mr. Amery as chairman of the Board. Dr. Drummond Shiels, Under Secretary of State for the Colonies, became chairman of the Research Grants Committee in place of Major Elliot, and Mr. Lunn, Under Secretary of State for Dominion Affairs, chairman of the publicity committee in place of Mr. Ormsby-Gore. The retiring Conservative Ministers have accepted invitations to retain their membership of the Board or of its committees, and the Board remains happily representative of all the three political parties in the United Kingdom.

The Board, encouraged by the marked goodwill shown to its purpose by the distributive trades of the country, and anxious to take the fullest advantage of trade experience, has lately strengthened its machinery by the appointment of a new main committee, to be known as the marketing committee. It believes that this committee will secure a regular and continuing contact between itself and the complicated system by which Empire products are distributed to the consumers of the United Kingdom.

Power of Research.—Scientific research, conducted with the aid of grants from the Empire Marketing Fund, is now in progress in the United Kingdom, in each of the Dominions and in numerous Colonies. Particulars of each grant and of the progress made in the investigations thus financed are given later in this report.

The range of Empire industries and commodities which these grants are designed to assist is considerable, and it would scarcely be practicable to summarise what is being done under any watertight divisions. Some grants—as, for instance, those concerning entomology and low temperature research—are relevant to more than one industry and to many commodities.

The essential part which scientists are playing in the development of Empire marketing may, however, be seen from the detailed section of this report. The veins of special knowledge and of enthusiasm which are being tapped are not the least enheartening features of the situation. The past year has witnessed a striking advance in the practice of intellectual co-operation within the Empire. Some scientific research schemes are being carried on with assistance from the Board's fund in the United Kingdom and others in the oversea Empire countries. Frequently the problem is being tackled by a team of workers closely in touch with one another, but scattered through the Empire. In all cases the results achieved are at the disposal of the Empire as a whole.

Systematic Trade Surveys.—The systematic survey of the wastage in imported Empire fruits has been continued in the Liverpool and in the London docks, and further reports have been issued and circulated among the oversea

producers concerned. Trade enquiries to estimate the extent and nature of competitive supplies and to obtain information on market requirements in regard to quality, grading and packing have also been undertaken. A series of retail market surveys has been carried out both nationally and in selected areas.

The publication of weekly intelligence notes, giving full marketing information for fresh fruit and for dairy produce, has been extended. An interesting development made possible by the support of the trade is the inclusion of statistics of approximately 90 per cent. of the butter held in cold storage. A promising activity is the issue of statistical surveys of the world position as regards the production and consumption of various foodstuffs.

Nation-Wide Advertising.—The Board has employed, as means of furthering the sale in the United Kingdom of Empire produce from home and overseas, seven methods of publicity. It directed during the year an advertisement campaign in the principal national and trade papers reaching many millions of readers. The general theme of Empire buying was kept in the foreground in all advertisements and was illustrated by specific appeals to buy, among other commodities, Canadian apples, New Zealand dairy produce, Rhodesian cigarettes, Australian dried fruit and South African oranges and soft fruits.

The use of special frames for the display of posters was extended, so that the Board now has these frames, with their regularly changing sets of posters, in 450 towns in the United Kingdom. Specimen frames have been erected in several oversea Empire countries. Posters were also shown, in connection with exhibitions, on the commercial hoardings. Suitable posters were reproduced in half size and in colour, and were issued, together with leaflets telling the story of the Empire industry or scene depicted, to over 20,000 schools in the United Kingdom that applied for them.

Two Million Leaflets.—The issue of other leaflets and of display material, including shop window bills and popular recipes, was very considerably increased. The total number of leaflets distributed by the Board in the year was nearly 2,000,000.

Lectures—the fourth method of publicity employed—were given under the Board's auspices to audiences totalling 500,000.

The British Broadcasting Corporation made it possible for the Board to give out a number of talks to housewives.

The value of exhibitions and shopping weeks was so apparent to the Board that it took part vigorously on many of these occasions. A pavilion was erected and given over to changing displays of Empire produce throughout the six months of the North-East Coast Exhibition. Space was taken at fourteen other exhibitions, and assistance was rendered at fifteen shopping weeks in various parts of the United Kingdom.

A new and extremely fruitful experiment is being tried at Glasgow, where the Board has rented a shop in a central position for six months and gives it over, for periods of a fortnight each, to individual Empire countries. The direct contacts thus formed with traders and with the public are proving most effective in opening up new and in broadening established lines of Empire trade.

Lastly, the Board has added to its experience of the cinema as an instrument of publicity. The first of its films to be released for public display has been exceptionally well reviewed and has secured satisfactory bookings. Other films are nearing completion. A beginning has been made with the preparation of a number of Empire interest films for display to school and other audiences.

Such in outline is the ground covered in the past year by the Empire Marketing Board.

Maize Growing in the Umtali District.

RESULTS OF GREEN MANURING.

By R. H. Fitt, Dip.Agric., Milk Recorder (late District Agricultural Adviser).

It will be of interest to farmers in other parts of the Colony to learn of the methods successfully employed in increasing the maize yield per acre in the Umtali district, and it is therefore proposed in these notes to detail the treatment and illustrate by photographs the results obtained on the farm Tomdale during the seasons 1928-29 and 1929-30.

During the latter season, heavy rains fell up to the end of December, but from then to the 10th February there was almost a complete drought. After the 10th February fair rains fell during the remainder of the growing season, the total rainfall on this farm for the year being 28.19 inches.

RAINFALL, 1929-30.

November—6.37 ins. rain fell on 10 days.
December—7.55 ins. rain fell on 17 days.
January—3.43 ins. rain fell on 8 days.
February—6.4 ins. rain fell on 5 days.
March—6.68 ins. rain fell on 13 days.
April—1.68 ins. rain fell on 6 days.
May—.59 in. rain fell on 4 days.

Fig. No. 1 shows 14 acres of Sunn hemp grown for green manuring during the season 1928-29. The crop flourished, and at the time the photograph was taken it was standing 6 ft. high. It was grown under a rainfall of 54.30 inches,

and the growing period was 74 days. Seed was sown at the rate of 45 lbs. per acre. All weeds were completely smothered by the crop.

Fig. No. 2 shows the same crop of Sunn hemp being ploughed under. The plough used was a 3-furrow disc, and, taking into consideration the enormous bulk of the crop being turned under, the plough can be seen to be doing very good work.

Fig. No. 3 shows the crop of maize planted on the 1st December, 1929, on the same block of land, and following the crop of Sunn hemp for green manuring shown in Figs. 1 and 2.

This field had been under cultivation for some 14 years and had had no previous fertiliser or manurial treatment other than the Sunn hemp ploughed in in 1928-29.

A dressing of 200 lbs. of high-grade superphosphate per acre was applied to the land broadcast and harrowed in in September, after the second ploughing following the green manuring. The maize was check-row planted by hand, four seeds to the hill being sown, and later thinned out, leaving only two plants per hill. The resulting stand was almost perfect. Later the army worm caused a little damage, especially around the edges of the land. This injury can be seen in the illustration.

During February there was almost a complete drought, but the plants on this land continued growing and evidently did not feel the lack of rain to any appreciable extent. Compared with land not green manured, the difference in the appearance of the plants at the end of the dry spell was very marked indeed, the non-green-manured area showing up poorly in comparison.

The yield of maize over this 14 acres of land was checked very carefully, and worked out at 31 bags per acre, whereas the average yield obtained from it during the 14 years prior to treatment was about 12 bags per acre.

Fig. No. 4.—The small field illustrated—in extent five acres—has been under cultivation for four years, and during the season 1928-29 Sunn hemp was grown on it for seed, a yield of 3½ bags per acre being obtained.

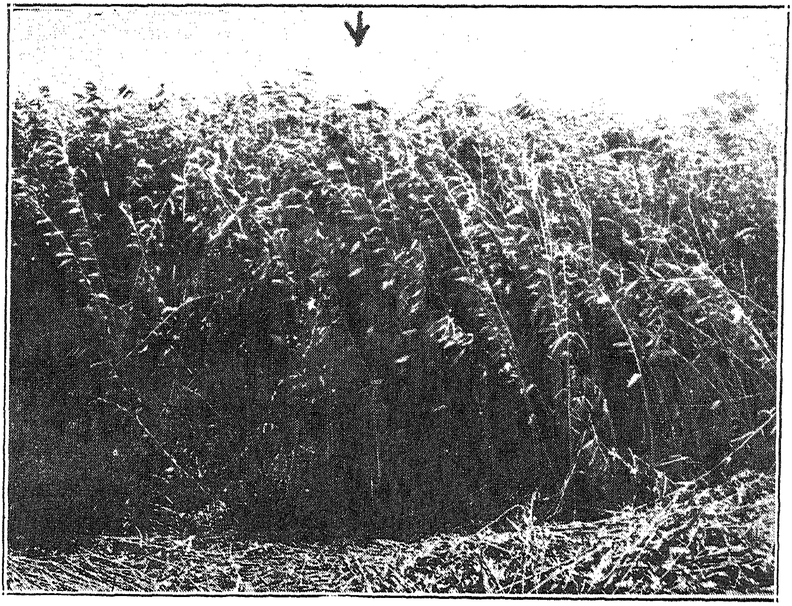


Fig. 1.—Part of 14 acres of Sunn hemp grown for green manuring, 1928-29, at Tomdale Farm, Umtali district.

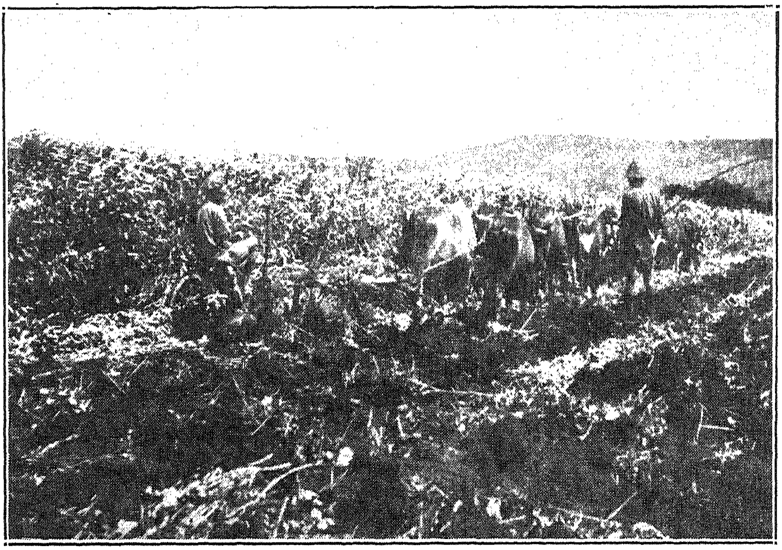


Fig. 2.—Crop illustrated above being ploughed under.

Fig. 3.—Crop of maize planted 1st December, 1929, following Sunn hemp shown in Figs. 1 and 2. Yield, 31 bags per acre.

Fig. 4.—Maize following Sunn hemp grown for seed. Yield, 29 bags per acre. Tomdale Farm, Umtali district.

Fig. 5.—Showing land under cultivation for 15 years with no special treatment other than a weed fallow. Yield low and unprofitable. Tomdale Farm, Umtali district.

Fig. 6.—Maize following velvet beans ploughed under, plus 200 lbs. of superphosphate per acre. Yield, 27½ bags per acre. Tomdale Farm, Umtali district.

The trash after threshing was burned on the land in four heaps; this was detrimental to the succeeding crop of maize, as nothing grew where these heaps were burned. It would have been better if the burning had been done off the land and if the ash had been scattered over the field.

In 1929-30 maize was planted, following the Sunn hemp grown for seed. This crop can be seen to be a very fine one, and a yield of 29 bags per acre was obtained. This land was in better condition prior to the Sunn hemp being grown than that illustrated in Fig. No. 3.

Fig. No. 5.—The land shown has been under cultivation for 15 years and has received no special treatment other than a weed fallow, the weeds being ploughed in at the end of the season. The yield has been low and unprofitable, due to lack of fertility. Considerable difficulty is experienced in keeping this field free from weeds, and insect pests are troublesome, while the physical condition of the soil is poor, owing to lack of humus. This is part of the main block of land illustrated in Fig No. 3, and will be planted with Sunn hemp in the season 1930-31.

Fig. No. 6.—During the 1928-29 season this field was planted to velvet beans for green manuring. The crop was only fair, and was ploughed under early in March. A dressing of 200 lbs. superphosphate per acre was given broadcast after the second ploughing and was harrowed in. Later, maize was planted by machine, and the resulting stand was very good. This land again did not suffer much during the dry spell in February, and the ultimate yield obtained was 27.5 bags per acre over 20 acres. This again shows a very considerable increase over the previous crops grown on this land, which did not average more than 8-10 bags per acre.

It is hoped that by the end of the 1931-32 season all the lands on Tomdale will have been green manured once. A four-year crop programme, including one green manuring every four years, is planned, but it may be found necessary for a time to reduce this on the poorer top lands to a three-year rotation, owing to the soil there becoming shallower and more lacking in humus. In this event each green manuring will be followed by only two successive crops of maize.

Assuming that, given a yield of 6 bags of maize an acre, the cost—including the bag—works out at 6s. 8d. a bag,

then if under similar conditions a yield of 12 bags an acre can be obtained, the cost is reduced to 4s. 4d. per bag, while if the yield is still further increased to 18 bags an acre, the cost is reduced again to 3s. 2½d. per bag. Even at to-day's prices there is a profit in growing maize when yields such as these can be obtained, but such results will only be achieved by careful farming and by making the fullest possible use of our knowledge of the means by which soil fertility can be improved.

Blue-Tongue Vaccine.

The following appeared in The Farmers' Weekly *of 30th July,* 1930:—

In view of the very considerable experience gained by the Division of Veterinary Services and Animal Industry from the issues of blue-tongue vaccine over a long period of years, it has been decided that the previous routine method of issuing the same vaccine for all classes of sheep, irrespective of the locality in which they are being run, should be discontinued. Extensive research work has clearly indicated the advisability of this step in the interests of sheep farmers throughout the country.

In future two different vaccines will be issued. The one is intended for immunisation of sheep which had not been injected during the previous season, and the other for use among sheep which have been injected during the previous season. When ordering their vaccine this season, farmers will benefit themselves and will greatly assist the Department by stating clearly whether or not the sheep to be injected were treated last season. With this information at the disposal of the officials, there will be no difficulty in deciding which vaccine to issue, and breeders can be assured of obtaining even better results than they have done in the past.—Division of Veterinary Services and Animal Industry.

[**As this vaccine is supplied by the Chief Veterinary Surgeon, Salisbury, to Rhodesian farmers, application should be made to that officer, specifying the quantities of each vaccine required.—Ed., R.A.J.**]

Southern Rhodesia Veterinary Report.

July, 1930.

AFRICAN COAST FEVER.

CHARTER DISTRICT.—Infection appeared amongst the remainder of the cattle on the farm Inhoek, and all animals involved were slaughtered. When the disease was discovered on this farm in January last the infection was confined, as far as could be judged, to one paddock, and all animals therein were slaughtered. The working oxen and some dairy cattle had been running in another paddock, and as far as could be judged were free from infection. It was decided to allow them to remain there and maintain constant supervision, but it is now evident that this paddock was not clean.

MELSETTER DISTRICT.—All the cattle on the farms Canterbury, Wolfscrag and Schaapplaats were moved to a temperature camp on the farm Vleiplaats.

TRYPANOSOMIASIS.

Two cases in Wankie, two in Hartley and one in Melsetter district.

QUARTER EVIL.

Very few cases reported.

TUBERCULOSIS.

One cow reacted to the tuberculin test on importation, and was destroyed.

SCAB.

One flock in the Selukwe district was placed in quarantine.

GENERAL.

A mortality of 27 head occurred in the Gwelo district. Investigation proved that death was due to diplodia poisoning.

IMPORTATIONS.

From Union of South Africa:—Bulls 10, cows 62, horses 43, donkeys 307, sheep 1,588. From Bechuanaland:—Sheep 710, goats 229, pigs 10.

EXPORTATIONS (CATTLE).

To Union of South Africa:—Johannesburg, for local consumption, 1,273; Durban, for overseas, 5,505. To Belgian Congo:—Slaughter 1,525, breeding 2,257. To Northern Rhodesia:—Slaughter 299, trek oxen 128.

EXPORTATIONS (MISCELLANEOUS).

To Union of South Africa:—Pigs 141. To Belgian Congo:—Horses 3, pigs 200. To Northern Rhodesia:—Sheep 307, goats 30, pigs 195.

J. M. SINCLAIR,
Chief Veterinary Surgeon.

Good Crops from Marandellas District.

An amateur farmer of the Marandellas district, who has been farming his land somewhat intensively and in close accordance with the advice of the Department of Agriculture, forwards to the Chief Agriculturist the following particulars of his 1929-30 crops:—

Maize.—From 36 acres of red contact soil, 453 bags, or 12½ bags an acre.

Of this area, 12 acres in 1927-28 grew tobacco, with 200 lbs. per acre of No. 4 tobacco fertiliser; in 1928-29 it grew maize without fertiliser, and in 1929-30 the maize crop received 100 lbs. of double complete maize fertiliser per acre.

Seven acres grew maize and beans in 1928-29, with 200 lbs. per acre bone and supers (crop very poor, owing to late planting), but in 1929-30 the maize—underplanted with pumpkins—received no fertiliser.

The remainder of the 36 acres was new land, broken up during the rainy season of 1928-29, the maize planted in

1929-30 receiving 200 lbs. per acre of bone and superphosphate.

Ground Nuts.—This crop, with 200 lbs. bone and supers per acre, yielded 40 bags of clean nuts in the shell from $1\frac{3}{4}$ acres.

Sunflower.—This crop also received 200 lbs. bone and supers per acre. Eight bags of clean, shelled seed was reaped from approximately a quarter of an acre.

"What does the Colonial Leaf Business Represent to Great Britain?"

The following is an extract from "Tobacco," the American Weekly Trade Journal, 31st July:—

"According to the annual report of the Commissioner of Customs and Excise, the quantity of Empire-unmanufactured tobacco consumed since the introduction of the preference system has steadily grown, and in 1928-29 amounted to 23.6 millions, or approximately 17 per cent. of the total consumption. It is to be noted, however, that this increase in consumption has been far short of the expectation of Empire tobacco producers, as is shown by the very considerable excess of imports over deliveries. This is especially true of tobacco from Rhodesia and South Africa. In the opinion of some trade authorities it is improbable whether, from this time on, tobacco from the Empire sources will make any further inroads on the demand for American tobacco. It is said that there will probably be some increase, but the rate of increase, it is expected, will be slow and will not exceed the amount of increase in the country's tobacco consumption.

"Based on the rate of deliveries during 1929, stocks of Rhodesia are now sufficient for two years and eight months. Imports of leaf tobacco from Nyasaland were practically 20 per cent. under those of 1928. Based on deliveries during the year 1929, stocks of Nyasaland are now sufficient for two years and three months."

Southern Rhodesia Weather Bureau.

AUGUST, 1930.

Pressure.—The mean barometric pressure for the month was slightly below normal, varying from normal at Umtali to 0.043 in. below normal at Fort Victoria.

Temperature.—The mean temperature for the month was below normal, varying from 4.4° F. below normal at Wankie to 0.5° F. below normal at Salisbury. The mean maximum temperatures were below normal, varying from 4.8° F. below normal at Wankie to 0.6° F. above normal at Essexvale. The mean minimum temperatures were also a little below normal. The mean relative humidity was below normal in most parts of the country.

RAINFALL.

ZONE B.—	
Bulalima-Mangwe—	
Semokwe Reserve	0.01
Chibi—	
Nuanetsi Homestead	0.35
Gwanda—	
Gwanda Gaol	0.02
Tuli	0.02
Insiza—	
Albany	0.11
Lancaster	0.04
Scaleby	0.05
ZONE C.—	
Gwelo—	
Wold Farm	0.03
ZONE E.—	
Belingwe—	
Doro	0.06

Bikita—	
Angus Ranch	0.07
Bikita	0.10
Chibi—	
Chibi	0.35
Lundi	0.35
Chilimanzi—	
Allanberry	0.07
Induna Farm	0.08
Mtao Forest	0.16
Mukowries	0.19
Gutu—	
Eastdale Estates	0.08
Insiza—	
Stoneham (Brae Valley)	0.13
Makoni—	
Craigendoran	0.08
Kairidzi	0.11
Marandellas—	
Wedza Reserve	0.12
Melsetter—	
New Year's Gift	0.61
Sabi Tanganda Estate	0.41
Ndanga—	
Bangala Ranch	0.20
Doornfontein	0.17
Triangle Ranch	0.35
Zaka	0.87
Selukwe—	
Selukwe	0.15
Umtali—	
Argyll	0.10
Embeza	0.16
Fern Valley	0.04
Jerain	0.16
Park Farm	0.12
Premier Estate	0.16
St. Augustine's Mission	0.08

Victoria—

Chevenden	0.64
Clipsham	0.20
Kimberley Ranch	0.16
Mashaba	0.03
Miltonia	0.09
Riverdene North	0.18
Silver Oaks	0.24
Victoria	0.15

ZONE F.—

Melsetter—

Chikore	1.22
Lettie Swan	0.55
Melsetter	0.65
Mount Selinda	1.50
Vermont	0.38

Umtali—

Cloudlands	0.14

Export of Cattle from Southern Rhodesia, 1930.

Month	Union		England.	Congo		N. Rhodesia.		Portuguese East Africa.		Total
	Slaughter		Slaughter							
	Union of S.A.	I.C.S. for overseas	On hoof	Slaughter	Breeding	Slaughter	Breeding	Slaughter	Breeding	
January ...	...	...	...	2,449	67	...	...	...	...	2,516
February ...	...	...	...	3,438	8	537	91	...	11	4.085
March ...	25	...	160	1,097	...	249	...	...	7	1,538
April ...	53	863	...	2,636	115	120	16	...	...	3,803
May ...	783	1.628	160	1,517	593	268	176	...	...	5,125
June ...	1,132	2,660	...	1,810	11	407	...	...	...	6,020
July ...	1,273	5,505	...	1,525	2,257	299	128*	...	...	10,987
August ...	1,661	5,939	...	2,673	...	332	...	...	7	10,612
September ...										
October ...										
November ...										
December ...										
	...	...	...	...	...	...	...	...	...	...

* Trek oxen.

Dates of Meetings of Farmers' Associations, Southern Rhodesia.

Name of Association.	Place of Meeting.	Secretary.	Oct.	Nov.
			1930	1930
Ayrshire—Sipolilo	Various farms	G. H. Cautherley	11	8
Banket Junction	Banket Hotel	A. M. Hutchinson	4	1
Beatrice District	Farmers' Hall, Beatrice	W. Krienke	30	27
Bindura	Bindura Farmers' Hall	W. E. Fricker	10	14
Bromley	Farmers' Hall, Bromley Siding	E. Taylor	1	5
Bubi	Queen's Mine	W. H. Perham	17	21
Bulawayo Landowners' and Farmers' Association	Library Buildings, Bulawayo	T. B. Hepburn	7	4
Chakari	Various farms	R. Codrington	16	20
Daisyfield	Daisyfield (Oct.), Somabula (Nov.)	L. E. Edwards	18	8
Darwendale—Trelawney	Various farms	Charles H. Tanner	22	26
Eastern Districts	Farmers' Hall, Chidza	W. E. Richards	11	8
Enkeldoorn	Enkeldoorn	C. N. Ludlowe	7	4
Enterprise	Farmers' Hall	E. P. Venables	7	4
Essexvale	Essexvale	Col. D. Judson	18	16
Felixburg—Gutu	Various farms	E. C. Fleetwood	11	8
Figtree Branch, R.L. and F.A.	Figtree Hotel	The Secretary	7	4
Gadzema	Gadzema Hotel	H. G. M. Liddell	10	14
Gatooma	Speck's Hotel	Col. J. A Smith	18	15
Gatooma (Golden Valley Branch)	Golden Valley Hotel	C. K. James	11	8
Gazaland (South Melsetter)	Farmers' Hall, Chipinga	J. Ward	18	15
Greystone	Quarrie Farm	P. J. van der Walt	...	8
Gwanda	Lowenthal's Building, Gwanda	N. J. B. Nilson	18	15
Hartley	Hartley Hotel	Mrs. F C. Watson	11	8
Headlands	Headlands	J. A. Eve	...	...
Hunter's Road	Hunter's Road	R. W. Twilley	25	29
Insiza South	Farm Lancaster	J. Campbell	9	...
Inyazura	Inyazura	W. P. Frudd	3	...
Lalapansi	Lalapansi	A. Watt	11	8
Lomagundi	Sinoia	F. W. Robertson	10	...
Lomagundi West	Various farms	James S. Brown	12	9
Macheke	Various farms	R. O. Jackson	...	...

Macheke Valley (Headlands) Farmers' and Tobacco Growers' Association	Various Farms	T. R. Colam	4	1
Makwiro	Makwiro	W. L. Parsons	17	21
Marandellas	Marandellas Farmers' Hall	E. Cruikshank	3	7
Marandellas, Southern	Various farms	B. V. Cherry	1	5
Mashonaland	Mashonaland Farmers' Hall, Salisbury	P. Wilson	10	14
Matobo South	Farmers' Hall, Malundi Farm	W. S. George	18	15
Matopo Branch, R.L. and F.A.	Farmers' Hall, Malundi	W. Mirtle	18	15
Mazoe (Concession)	Various farms	Douglas Southey	10	14
Mazoe (Glendale)	Farmers' Hall, Glendale	Mrs. A. G. McCall	8	12
Melsetter	Court House, Melsetter	Capt. E. H. Allott	11	8
Ngezi-Umniati	Harvieston, Enkeldoorn	Miss Harvie	25	29
North Melsetter	Various farms	P. F. de Bruyn	11	...
North Umniati	———	J. F. Eagar	Not	received
Norton and Lydiate District	Norton	A. Jones	3	7
Nyamandhlovu	Nyamandhlovu	R. D. McLean	...	...
Odzi District Farmers	Odzi Hotel	M. Goldberg	4	1
Poorte Valley	Various places	A. D. Wilson	18	15
Que Que	Offices of the Que Que Sanitary Board	A. A. Ackerman	18	15
Rusape Farmers' Association	Rusape	E. C. Harrington	4	1
Salisbury South	Various farms	P. Linton	29	26
Shamva	Shamva Court House	L. H. S. Paxton	17	21
Shamva North	Various farms	Mrs. E. J. Stevenson	18	15
Two Rivers Farming Association	Various farms	W. L. Parsons	18	15
Umboe (Branch of Lomagundi F.A.)	Various farms	G. T. Gover	11	8
Umvukwe Farmers' and Tobacco Growers' Association	Various ranches	Com. Wrightson	11	8
Umtali	Strickland Memorial Hall, Umtali	A. Howat	3	7
Umvuma and District	Court House, Umvuma	S. T. Montgomery	17	21
Victoria	Victoria	J. A. Halliday	4	1
Wankie District	———	F. H. Going	Not	received
West Umvukwe Farmers' Association	Various farms	G. H. Gordon	4	1
Western	Plumtree Hotel	The Secretary	11	8
Willoughbys	Willoughbys	A. E. Roberts	Not	received

Rhodesian Milk Records.

Unofficial Milk Records.

Name of cow.	Breed.	Milk in lbs. to date.	Butter fat in lbs. to date.	No. of days.	Name and address of owner.
Langton June ...	Grade Friesland	3,193.50	123.53	146	M. Inge, Sinoia
Langton Edna...	do	2,859.50	100.48	120	do do
Langton Mignonne	do	2,023.00	82.57	98	do do
Langton Gwen...	do	1,543.50	56.78	78	do do
Langton Molly...	do	805.50	32.67	40	do do
Langton Ackland	do	762.00	33.99	41	do do
Langton Nancy	do	641.00	31.41	31	do do
Langton Dorothy	do	410.50	20.53	30	do do
Langton Marjorie	do	419.00	20.11	23	do do
Langton Eleanor	do	267.00	9.88	20	do do
Langton Barbara	do	371.50	14.86	20	do do
Langton Maude	do	351.00	15.80	19	do do
Palm Tree Buttercup	do	284.50	11.95	19	do do
Langton Primrose	do	224.00	8.51	14	do do
Langton Dulcie	do	178.00	8.70	13	do do
Langton Rhoda	do	153.50	7.68	12	do do
Langton Susan...	do	160.00	6.08	13	do do
Langton Dolly ..	do	209.50	9.43	10	do do
Langton Moffat Brush	do	211.50	9.31	10	do do
Langton Claire...	do	131.00	6.55	8	do do
Palm Tree Ethel	do	164.50	6.42	7	do do
Beatrice ...	do	3,9[illegible]7.50	145.42	175	C. J. Orford, Rusape
Miss Muffet ...	do	2,719.50	114.40	154	do do
Bertha ...	do	6,134.10	270.75	280	do do
Ginger ...	do	4,602.10	174.36	245	do do
Rosemary ...	do	5,413.10	242.14	273	do do
Josephine ...	do	4,356.10	178.21	217	do do
Whiteface ...	do	4,459.00	193.85	238	do do
Jill	do	3.932.50	1[illegible]4.81	197	do do
Beauty ...	do	5,166.00	192.59	189	do do
Pinkie ...	do	3,829.00	152.35	189	do do
Snowdrop ...	do	3,587.50	129.31	98	do do
Bess	do	4,406.50	167.26	140	do do
Bunny ...	do	4,242.00	169.87	182	do do
Punch ...	do	3,087.50	129.67	161	do do
Ruby	do	3.669.90	152.18	203	do do
Cherry Blossom	do	3.444.00	129.45	203	do do
Twilight ...	do	3,229.10	153.75	154	do do
Poly	do	3,978.10	170.29	210	do do
Granny ...	do	2,691.50	110.92	133	do do
Daisy... ...	do	2,905.00	122.44	147	do do
Bluebird ...	do	2,407.00	101.49	133	do do
Twinkie ...	do	2.743.50	106.17	135	do do
Peggy ...	do	1,519.00	54.60	70	do do

RHODESIAN MILK RECORDS (continued).

Unofficial Milk Records (continued).

Name of cow.	Breed.	Milk in lbs. to date.	Butter fat in lbs. to date.	No. of days.	Name and address of owner.
Smile	Grade Friesland	7,560.00	297.70	280	F. Pickering, Sinoia
Beatrice ...	do	4,469.50	219.71	266	do do
Mabel ...	do	5,469.50	222.06	287	do do
Umfuta ...	do	4 686.50	176.23	259	do do
May	do	4,189.50	181 87	252	do do
Iris	do	3,752.00	171.58	252	do do
Noreen ...	do	1,792.00	73 90	126	do do
Rhoda ...	do	3,759 00	155.16	224	do do
Ready ...	do	3,924.00	171.21	224	do do
Dolly	do	4,127 00	193.02	224	do do
Beauty ...	do	3,227.00	156 73	189	do do
Bella	do	2 191.00	107.80	154	do do
July	do	3,108 00	123.76	133	do do
Nglan ...	do	2.065.00	87.86	98	do do
Stella ...	do	1,865.50	85.61	98	do do
Violet ...	do	1,893.50	87.25	105	do do
Jimmie ...	do	1,286.50	48.19	77	do do
Niniah ...	do	878.50	31.44	56	do do
Trixie ...	do	791.00	30 09	49	do do
Lovan ...	do	493.50	17 77	21	do do
Cadock ...	do	441.00	17.64	21	do do
Gracie ...	do	283.50	11.34	14	do do
Heather ...	do	595.00	29.75	21	do do
Queenie ...	do	329.00	13.16	14	do do
Mabel ...	do	385.00	17.33	14	do do
Jeannie ...	do	371.00	14.47	21	do do
Palm Tree Lady II.	Friesland	4,369.50	175.00	267	J. S. Struthers, Sinoia
Palm Tree Laura III.	do	3,177.90	130.81	276	do do
Palm Tree Violet I.	do	6,162 00	248.34	339	do do
Palm Tree Pearl II.	do	5,454.80	280.18	339	do do
Palm Tree Violet III.	do	3,444.70	150.89	276	do do
Palm Tree Amy II.	do	1,286.60	56.29	157	do do
Palm Tree Ida II.	do	4.508.40	199.90	311	do do
Palm Tree Corral II.	do	1,807.00	83.75	184	do do
Palm Tree Pansy II.	do	4,071.00	183.76	239	do do
Palm Tree Lettie	do	2,095.10	86.87	157	do do
Palm Tree Lucy II.	do	4,982.50	215.06	245	do do
Cavers Panic ...	do	5,500.00	203.90	267	do do

RHODESIAN MILK RECORDS (continued).

Unofficial Milk Records (continued).

Name of cow.	Breed.	Milk in lbs. to date.	Butter fat in lbs. to date.	No. of days.	Name and address of owner.
Palm Tree Rosy V.	Friesland	3,216.00	152.35	257	J. S. Struthers, Sinoia
Palm Tree Cherry Blossom	do	4,519.50	190.21	263	do do
Palm Tree May	do	5,680.50	234.34	207	do do
Palm Tree Granny	do	5,206.50	232.20	210	do do
Palm Tree Peggy II.	do	3,065.50	121.92	210	do do
Palm Tree Gem II.	do	3,945.00	181.96	210	do do
Palm Tree Moonshine	do	4,510.00	165.34	203	do do
Palm Tree Cherry Blossom II.	do	2,488.50	120.21	196	do do
Palm Tree Queenie III.	do	3,310.50	133.05	217	do do
Palm Tree Lady III.	do	2,366.00	102.47	154	do do
Palm Tree Maid II.	do	3,136.00	133.58	140	do do
Palm Tree Lena	do	2,304.50	76.40	133	do do
Palm Tree Corral	do	2,929.50	117.97	133	do do
Palm Tree Queenie II.	do	1,873.00	57.27	126	do do
Palm Tree Lettie	do	1,543.50	53.73	77	do do
Palm Tree Laura	do	1,449.00	64.90	70	do do
Palm Tree Daphne	do	857.50	38.07	49	do do
Palm Tree Tootsie	do	4,231.00	187.88	161	G. Struthers, Sinoia
Palm Tree Molly	do	3,899.00	164.54	154	do do
Palm Tree Frills	do	3,094.00	125.62	133	do do
Palm Tree Milly II.	do	3,451.00	151.00	119	do do
Palm Tree Nella	do	2,086.00	81.36	91	do do
Palm Tree Noonie II.	do	1,848.00	73.24	77	do do
Naomi ...	do	1,263.50	45.43	63	do do
Daisy	Grade Friesland	4,266.50	177.15	245	A. F. Valentine, Umtali
Bud	do	1,883.00	70.72	105	do do
Vanicka ...	do	864.50	30.27	49	do do

Farming Calendar.

October.

BEE-KEEPING.

Bush bloom is now on, the queens consequently are laying vigorously, therefore give space and ventilation. In good districts, where stocks are strong, nectar may be coming in freely, and to prevent swarming it may be necessary to remove a crate of honey. By using the carbolic cloth, the operation is easily and quickly accomplished. At this season, whenever a crate of honey is removed, a properly fitted empty crate must take its place, otherwise the bees will swarm. Keep the apiary clear of weeds, and all hives well shaded. Feed any weak stocks.

CITRUS FRUITS.

Citrus trees should not be permitted to suffer for want of water if a good setting of fruit is desired. Continue irrigation at fairly frequent intervals, especially if it is windy. Cultivation must follow each irrigation when the soil is fit to work, otherwise a large amount of moisture will be lost by evaporation. The packing of late fruit for export should be completed early in the month or before the rains commence. If rains intervene, the carrying properties will be affected and the fruit will probably break down in transit. Suppress all stem growths or water shoots as they appear. Young trees planted last season may with advantage have the stems whitewashed or washed with Bordeaux mixture paste; this will prevent undue sun-scalding of the unprotected stems. Plant cover crops with the first good rains.

CROPS.

If not already attended to, overhaul all farming implements and replace worn parts to ensure efficiency. Shell ground nuts required for the season's planting. Ploughing of old lands should, at latest, be finished this month. If seed potatoes will not keep in good condition until next month, they may be planted now, but later planting is better. Edible canna may be planted this month before rain falls. Also velvet beans, dolichos beans and sunn hemp towards the end of the month for green manuring. Harvest winter cereals and plough under the stubbles as soon as possible after harvest. When rains have fallen, use every effort to improve the tilth of the lands which will be the first to be planted. On cloddy lands already ploughed, seize the opportunity to break down the clods by disc and drag harrowing as showers of rain fall. A spiked roller is very useful for this work. A good tilth means good planting, and a good stand of maize; therefore, do everything possible by cross ploughing, disc and drag harrowing to bring the soil into good condition for seeding.

When necessary, keep the harrows going to check early weed growth. Clean lands at this time of year are an insurance against cutworm and other insect pests. If weather conditions permit, plant a trap crop of maize to attract the stalk borer. New land to be ploughed and intended for planting this season should be cleared of heavy grass or weeds by burning or cutting to ensure good work being done by the ploughs.

Seasonal showers of rain are liable to spoil bricks unburned. See that bricks which have been made are protected from rain. Clean out guttering and down-spouts of house and farm buildings. Press on with development work so as to have this completed before rains break.

DAIRYING.

During the month of October and until such time as the rains have commenced and green grazing is available, dairy stock require to be almost entirely stall fed. Cows in milk and cows due to calve should be liberally fed on succulents and concentrates in order that they may commence the dairying season in good condition, and make full use of the early grazing for milk production. Dairy cows that are underfed at this time of the year invariably produce milk of poor quality, and usually throw weedy undersized calves; furthermore, they do not pick up in condition until comparatively late in the season.

During October, the cow's ration should consist of succulents such as silage or green feed, etc., legume hay of good quality and a liberal allowance of concentrates; a pound or so of a feed such as ground-nut cake is invaluable for dairy stock at this time of the year.

Weather conditions are generally fairly warm during the month of October, and every precaution should be taken to keep the cream, which is used for butter-making or which is sent to the creamery, as cool as possible. The can or bucket containing the cream should be placed in a basin of water or concrete trough, in the dairy, and exposed to a draught; a piece of kaffir blanket, which dips into the water, should be wrapped around the can or bucket containing the cream. Churning of cream for butter-making is best carried out early in the morning—before sunrise if possible; the coolest water obtainable should be used for washing the butter whilst in the granular stage.

At this season of the year cheese-makers may find that the milk is deficient in butter fat; this is generally the result of under-feeding or unsuitable feeding. Cheese made from milk of low fat content is invariably dry and hard, defects that are accentuated by over cooking the curd or by cooking at too high a temperature. The curd should be firmed in the whey at a temperature not higher than 98° F. to 100° F.

DECIDUOUS FRUITS.

Keep all trees well watered until the rains commence; cultivate after each watering to prevent evaporation of added moisture. Rub off all undesirable shoots, such as those arising on the main stem near the ground; also those shoots having a tendency to crowd each other. Two or more shoots should not be allowed to develop from the same spot on any part of the tree. Rub off the undesirable ones soon after they appear. The fruit of early peach trees should be thinned out if a heavy crop has set; this thinning will result in a crop of large-sized fruit. All fruit should be thinned out if necessary.

ENTOMOLOGICAL.

Maize.—Where circumstances permit early growth of maize, crops planted late in October are liable to suffer in December from stalk-borer, especially if only a few acres are involved. If maize can be planted early in October, the plants are usually large enough by December to outgrow serious damage. Maize beetle is now in its pupal stage. Thorough working and smashing up of the soil at this time will destroy great numbers.

Tobacco.—See notes for last month, together with article in the "Rhodesia Agricultural Journal" for October, 1926, on "Baiting of Tobacco Seed Beds with Cyanogas Calcium Cyanide." The lands must be kept free from all weeds which caterpillars may feed on, and it is well not to have maize lands, tomato and Cape gooseberries near the lands; a clearing of some depth is advisable, which must be regularly weeded. If poisoned bait is put down, it has been found that a covering of sacking

or leaves will help to retain moisture and thus give further attraction, especially at this time of the year. In order to lessen the heavy infestation of caterpillars and other insect pests in the seed beds, coverings of hessian or cheese cloth should be kept over beds, especially at night; cutworm moths are nocturnal in habit, so that the coverings of the beds need to be moth-proof at night. Notwithstanding precautions in the covering of the beds, insects will enter, and after the emergence of the seedlings a weekly spraying should be carried out. Lead arsenate at the rate of $1\frac{1}{2}$ ozs. (powder) or 3 ozs. (paste) in a 4-gallon petrol tin can be sprayed on the plants once a week to keep insect pests in check. Lead arsenate can be safely used with Bordeaux mixture, the mixture not reacting upon one another. The two combined sprays act as a preventative and deterrent to insect and fungoid troubles.

Cotton.—Thorough cultivation and keeping down of weeds should be resorted to in order to lessen the infestation of over-wintering pupæ, by exposure to the sun, and birds.

Potato.—Avoid introducing root gallworm and potato diseases to valuable land under irrigation or to the home garden with seed potatoes. Growing plants in October may be defoliated by caterpillars, or the tops severely injured by the potato tuber moth. Spray with arsenate of lead (powder), 1 lb. to 30 gallons of water; or (paste), 1 lb. to 16 gallons of water.

Cabbage, Turnip, etc., are apt to suffer severely from diamond back moth and webworm. Dust regularly with Paris green, 1 lb.; fresh water-slaked lime, 20 lbs. For cabbage aphis, water liberally, and wash plants regularly with a forceful stream of water from a hose or spray pump.

Beans and Peas are little attacked by insects at this time of year. If aphis (green fly) is troublesome, the plants may be sprayed with soap wash or tobacco wash. Leaf-eating beetles are best destroyed by hand.

Cucumbers, Marrows, etc., may be attacked by leaf-eating beetles, which quickly destroy the young plants. The young plants may be protected by gauze covers. Once vigorous growth has started, the damage is negligible.

Citrus.—All out-of-season fruit should be removed by this time. Destroy all fruit "struck" by the false codling moth. Aphis may be controlled by very careful spraying with the combined "Lime-Sulphur-Nicotine" spray (for details see "Rhodesia Agricultural Journal," Sept., 1926, page 871), while the yellow thrip may also be kept in check by this spray. Avoid using miscible oils for citrus spraying. A careful search should be made for the American bollworm ("Heliothis obsoleta"), and the Chief Entomologist should be immediately informed should this pest be found.

Deciduous Fruit Trees, including grape vines, are liable to attack by chafer beetles. Heavy spraying with lead arsenate (paste), 1 lb. to 10 gallons of water, or (powder), 1 lb. to 20 gallons, appears to afford considerable protection, but the leaves need thoroughly coating.

Fig.—Fruit infested with fig weevil should be collected regularly and destroyed.

FLOWER GARDEN.

All flower seeds, annual and perennial, may be sown as in September. A word or two on open seed beds may not be out of place here. These beds should be prepared in a sheltered position, and the soil should be well and deeply dug. This is most essential, as in this state the soil when once watered is more easily kept moist, and is not so liable to cake. The top dressing should be free from all undecayed vegetable matter, and when sown, the seeds should be covered with a thin dressing of fine light soil, over which a thin covering of grass may be placed to check evaporation. Transplanting from boxes or beds should be done on a dull day or towards evening; the plants should be well watered before being

removed, and the roots disturbed as little as possible, care being taken that the latter have their full depth and spread when planting.

VEGETABLE GARDEN.

As in September, nearly all vegetable seeds may be sown. Early potatoes should be earthed up when reaching the height of about eight inches. In planting a small amount of marrow, melon, cucumber, and pumpkin, the writer has found it economical to sow the seed one in a tin and transplant when about four inches high in hills. A few cucumbers planted in this manner yielded nearly 400 a week for about two months. Sweet corn and maize may also be sown this month.

FORESTRY.

The main sowings of Eucalypt (gum) seed should be made either in seed trays or in well prepared seed beds. A well-broken soil forming a fine tilth in the seed bed ensures more successful germination and better plants. If transplants are being used, any seedlings which are ready should be pricked out.

Seedlings in open beds may have their tap roots cut so as to develop fibrous lateral roots, and thus produce good type stocky plants. Remember the plant feeds through its roots, hence the better the root system, the healthier the plant and the greater its chances of successful establishment. If conditions are favourable, cross-plough and harrow land for planting broken up in early autumn.

POULTRY.

October is usually a hot month, and poultry keepers should therefore see that their birds have access to shade during the day. At the same time they should have plenty of air. One often sees birds during hot weather sitting under dense bushes, which is almost worse than no shade at all.

All houses should be examined and, if necessary, repaired. It is advisable to repeat the caution that birds must have dry quarters.

Many poultry keepers do not realise the vital necessity of giving their birds especially the young stock, plenty of succulent green food during the hot weather. It should be cut up and placed in boxes or hoppers about 7.30 a.m. and 5 p.m., and, if very hot, also at noon; it should never be placed in the sun. As much as the birds will eat should be supplied. Lack of it, especially during hot weather, causes a reduced output of eggs, smaller eggs and light-coloured yolks; further, a disease known as "nutritional disease" is likely to affect the birds and cause deaths. The symptoms are much like those of eye roup, without the well-known offensive smell of roup. It is due to the fact that vitamine A, which is present in large amounts in all succulent green foods, and which is so necessary for nutrition, is lacking. There is no doubt that many chickens and fowls die each year from this cause.

Ducks.—These during the hot weather require even more shade than do fowls; they cannot stand the direct rays of the sun nor sultry heat. The houses should always have dry floors, and should be overhauled before the rains commence. Ducks sleeping on damp floors often contract rheumatism and cramp. The floor of the duck house should be raised a few inches, thus ensuring a dry bed.

As many ducklings should be hatched as possible now, provided, of course, there is the prospect of a sale for them at ten weeks old. They thrive best in the wet weather.

Turkeys.—Stop hatching until after the wet season is over. To rear turkeys in the wet weather entails a good deal of time, labour, expense and often losses. Once a young turkey chick gets wet, it will probably die; at any rate it will never be the same bird it would have been had it not got wet. Give the older turkeys all the range possible; the further

afield they go, the better grown birds they become, and less is the expense of feeding. See also that their roosting quarters are water-tight before the rains commence.

STOCK.

Cattle.—Ranching cattle on granite veld will in many instances be in fairly good condition on account of the early grass in the vleis, etc. On the diorite soils and later veld the cattle owner will still have to watch his weaker cattle carefully. In any case all supplies of hay, ensilage, majordas, etc., should be carefully husbanded in anticipation of possible late rains, but at the same time every effort should be made to prevent cattle becoming weak. Dairymen will need to feed highly both with succulents and green foods. Calves should be weaned and branded, if this has not already been done, and care should be taken that they do not suffer any serious set-back by reason of the want of veld. If calves are not desired in mid-winter, the bulls should be taken out of the herd now until the end of January. Care should be taken to provide a plentiful supply of clean water, and dipping must be regularly attended to.

Sheep.—If spring lambs are expected, one should see that the sheep shed is in order, and that there is a supply of hay, ensilage or mealies for the poorer ewes in the case of late rains. All drinking places should be cleaned out, and care taken that the water supply is sufficient.

TOBACCO.

Continue to sow seed beds. Where grass has been put on the seed beds to assist germination of seed a daily inspection should be made, and as soon as the first few plants make their appearance the grass should be raised up a little from the bed in order to prevent the plants growing "spindley." All possible preparation for the coming planting season should be made.

VETERINARY.

White scour is prevalent in spring—November and December—but dipping is eradicating this disease. There is still danger from vegetable poisoning, and it will only disappear when there is plenty of good grass on the veld.

WEATHER.

This is apt to be a hot, dry month, and rather trying, therefore, to man and beast, and the strong winds which blow at this season add to the general discomfort. Evaporation is, as a consequence, at its greatest at this time of year, and dams and pools lose most from this cause. The prevalence of veld fires at this time of year adds to the anxiety of the stock owner.

The rainy season has occasionally started early in October, but for practical purposes it need not be expected before the end of this month. The days are becoming warmer, and often even hot and oppressive. Clouds gradually collect, at first disappearing at sunset, but later becoming more persistent. Sheet lightning is usually frequent, and showers of gradually increasing severity mark that the rainy season has set in. Steps should be taken in advance to provide for the run-off after such torrential rains, otherwise serious loss may result.

The normal rainfall varies from three-quarters of an inch to an inch in the different portions of the country. The rain usually occurs in the form of thunder-showers, which are not long sustained and are fairly local, but the total rainfall experienced during the month does not vary much over the whole country, with the exception of the eastern border, where the rainfall is usually heavier.

November.

BEE-KEEPING.

Now that the first honey flow is on, be sure the hives stand level, whether working them for extracted or section honey. This is important, saving annoyance when preparing the product for market. Occasionally, where bees have not been thoroughly subdued, they object to the removal of honey; postpone the operation for 24 hours. Where increase of stocks is required, artificial swarms can now be made. Use care in storing honey.

CITRUS FRUITS.

If no appreciable rain has fallen, irrigation must be resorted to in order to keep the trees in good growth and to prevent any check to fruit development. This is a good month to plant green crops. Sunn hemp is possibly the best crop to smother weed growth and supply humus-forming material after it is ploughed in. If not already done, storm drains should be made on the sloping ground to prevent erosion of the surface soil during heavy storms. Where new plantings are contemplated, the holes should be dug and everything got in readiness for planting if the trees are ready for lifting in the nurseries. All unthrifty trees could with advantage have an additional amount of fertiliser and manure applied during the month. Keep down all water shoots.

CROPS.

Take note when the first rains fall, and see what leaks there are, if any, in the farm buildings. Do not neglect to effect such repairs as are necessary. Early in the month see that the planters are in perfect order, and that they drop the different seeds to be planted evenly and at the right distance. Try them out on the farm road. Hasten the work of getting the lands for early sown crops into as good a condition for seeding as possible, so that the first and most favourable opportunity for planting may be seized. The young plants make more rapid growth in a good seed bed. Utilise exceptionally early rains for this purpose rather than for planting. The holes for check-row planting of maize can continue to be prepared until sufficient rain has fallen to allow of planting. Velvet beans and dolichos beans for seed or hay may be planted dry if the land is in good order. With favourable weather, planting of maize, velvet and dolichos beans and cotton will commence about the middle of the month, and will continue as the condition of the land and the rainfall permit. Main crop potatoes should be planted from now on to January. Dhal may be planted for seed or green manuring—if for seed, a frost free situation is necessary. Kaffir corn for seed may be planted this month. Green-manure crops requiring a long growing season should be planted. Destroy, by feeding or burning, early planted trap crop of maize or volunteer plants which have become infested with stalk-borer.

If weeds are beginning to show, keep the harrows going in front of the planters. If weeds are too advanced to be killed by drag harrows and too numerous to be dealt with by hand labour, use the disc harrow or lightly re-plough the land. If the tilth is good, do not be afraid to harrow the young maize. This will save much labour later on by destroying the weeds while they are small.

DAIRYING.

In a normal year veld grazing should be plentiful in November, and the feeding of dairy stock is then very much simplified; veld grass in a green and succulent condition is practically all that is required for animals of less than average production. Heavy milking cows, however, on early pasture, require extra feed in the form of concentrates, while the latter should always be fed to dairy stock which are in poor condition

at this time of the year. Young calves should not be turned out to graze with the herd, and in wet weather are best kept in a clean, dry, airy pen. Weaned stock, which have not hitherto had access to green pasture, should be gradually accustomed to the change in diet and may at first be turned out to graze for short periods. Young stock on pasture should also receive a small daily allowance of concentrates.

Farmers supplying cream to the creamery should adjust the cream screw to the separator so that the latter will separate a cream testing 45 to 50 per cent. butter fat. Cream of this consistency will keep better than thinner cream. It should be borne in mind that it is practically impossible to produce first-grade cream if the cattle are milked in a muddy kraal. In the absence of a cow shed, every endeavour should be made to erect a small milking shed in which four or five cows can be tied, milked and fed. A small shed of this kind is also essential to obtain clean milk for cheese-making. Milking in a muddy kraal invariably results in a gassy, bitter cheese being produced.

The shelves of the cheese room should be scrubbed with boiling water and soda, and for the last rinsing a weak solution of formalin may be used. This should prove effective in controlling cheese pests.

DECIDUOUS FRUITS.

Continue thinning out fruit on the trees if a very heavy setting has occurred. A small amount of large-sized fruit is preferable to a large crop of small fruit. Thin down the inner growth of new shoots if they have a tendency to crowd each other, and stop all suckers and main stem growths as they appear.

ENTOMOLOGICAL.

Maize.—Crops planted before the last week in this month are liable to suffer later from stalk borer. At Salisbury, crops planted after 27th November have escaped serious injury, but early December plantings are probably the safest. Volunteer maize is commonly badly infested and should be cut out and removed immediately, otherwise the borers tend to spread to surrounding plants. If rain has fallen sufficiently early, lands may be baited at the end of the month against surface beetles, snout beetles and other pests which tend to reduce the primary stand of plants. The formula is arsenite of soda 1 lb., cheapest sugar 8 lbs., or molasses 1 gallon, water 10 gallons. Dip chopped Napier fodder or other green stuff and distribute broadcast. The poison may be sprayed over volunteer maize and weeds on land with good effect. Cutworms do not usually appear in numbers until December, except in low-lying land. Succulent green stuff soaked in a 2 per cent. solution of sodium fluoride is the most recent formula for poisoned bait, but destruction of these pests is difficult. Keep the land clear of weeds as a preventive measure. If the young plants are attacked by the black maize beetle (heteronychus), the only remedy is to destroy by hand. Good, clean farming will control these pests to a large extent.

Tobacco.—This crop is subject to many pests in its early stages, although attacked by a few after vigorous growth has started. Keep cheese cloth covers on seed beds at night to exclude pests, and spray regularly with arsenate of lead (powder) 1 lb. in 30 gallons of water to protect against leaf-eating insects, etc. Lands may be baited against surface beetles with maize bran moistened with arsenate of soda 1 lb. in 30 gallons of water. Distribute in balls about the size of a golf ball and cover over with branches or anything to protect from sun. Place one ball to each ten plants and moisten again when dry.

Potato.—The first brood of leaf-eating ladybirds appear in November. Spray with arsenate of lead (powder) 1 lb. in 30 gallons of water. Spraying is also useful against the black blister beetles, which sometimes attack the crop on sandy soils. Keep the soil of irrigated crops well hilled and in friable condition as a precaution against tuber moth laying eggs on the tubers.

Kitchen Garden.—Plants of the cabbage family are liable to attack by diamond-back moth and other leaf-eating insects. When considered desirable, young plants may be dusted lightly with arsenate of lead (powder). Cabbage aphis may be kept in check by liberal watering and frequent washing with a forceful stream of water from a hose pipe or spray pump. Drenching the plants regularly with cold water is also held to be a good remedy for the diamond-back moth mentioned above.

Deciduous Fruits.—Young trees may need spraying with arsenate of lead (powder) 1 lb. in 20 gallons of water as a protection against chafer beetles, whose attack may check the growth very seriously. Choice varieties of early peaches may be netted to protect them from fruit-piercing moths.

When in doubt as to the identity of any pest or the method of dealing with it, apply promptly to the Chief Entomologist, Salisbury, bringing or sending specimens of the insects concerned. Note, however, that it is sometimes feasible to prevent injury from pests for which no practical remedy is known. Farmers should therefore endeavour to obtain some knowledge of the pests of the crops they are growing through the articles published in this Journal.

FLOWER GARDEN.

All seeds may now be planted. Annuals for January flowering should be sown, amongst which the following will be found to do excellently in this country:—Balsam, Calliopsis, Centurias, Chrysanthemum, Dianthus, Escholtzia, Marigold, Mignonette, Gallardia, Phlox, Poppy, Nasturtium, Nigella, Verbena and Zinnia. These are all hardy, and may be sown in the open either in beds or in the position desired for flowering. Advantage should be taken of each shower of rain during this month to keep the soil well worked and loose.

VEGETABLE GARDEN.

All vegetable seeds may be sown during this month. Tomatoes and early peas and beans should be staked. The soil should be kept loose and free from weeds, which now get troublesome. Sow pumpkin, mealies, peas and potatoes.

FORESTRY.

Sowings of eucalypt (gum) seed should be made for late planting. If fresh seed of cedrela toona is available, sowings should be made. Keep the seed beds moist and free from weeds. The tap roots of early seedlings may be cut back in order to form hardy, stocky plants most suited for planting. Continue with pricking out if transplants are to be used.. Prepare all land to be planted by cross-ploughing and harrowing. A well prepared soil is a good fertiliser; it assists establishment and reduces failures.

POULTRY.

Some birds will now be commencing to moult. This will cause a decrease in the number of eggs laid. The poultry keeper, therefore, should see that his birds come through the moult as quickly as possible. Some birds will lay and moult simultaneously, but these are the strongest, most vigorous and the best layers; the majority do not. The process of moulting is a natural one, but it is a severe strain on the system. Fowls that are not too fat, and can stand extra feed at the commencement of the moult, come through it best. More green and animal food should be given, and the utmost care taken that they are not exposed to cold or wet, otherwise they will not only take longer to moult, but go off in condition. A little linseed stewed, or linseed meal, or ground nut meal and milk should also be given. There will next month be a demand for table birds, and such as the poultry keeper intends to sell should be selected. In making this selection, it is no use choosing old or scraggy birds, for it is hopeless to attempt to fatten these, or make them good table birds. Do not coop them up till a fortnight or so before they are to be sold; give them free range and feed

them well, with at least one feed of soft food mixed with milk once a day. Turkeys destined for the Christmas market should have free range, but also a feed of soft food once a day, and a good feed of mealies in the evening.

STOCK.

Cattle.—Normally rains should have fallen and the veld should be plentiful now. Beyond careful dipping, ranchers should not have much worry. If the season is bad, the poorer cattle should be drafted out and given a little hay, ensilage or mealies daily. Dairymen will not require to feed much succulent food, and usually the more expensive protein foods may be considerably curtailed at this time, but good sweet hay and mealies will be found to be very beneficial to milch cows, even if the veld is very plentiful. Clean dry sleeping places for both cows and calves will pay handsomely for any extra trouble involved. Young calves do not need to walk far, and in wet weather are much best in a clean dry pen. Watch for ticks.

Sheep.—Keep the sheep on high dry land. Be careful to keep the ticks down. Be sure the kraal or sheep shed is dry and clean, and that there is shelter from the rain for young lambs.

TOBACCO.

Continue to sow seed beds, watering, etc. When early beds become overgrown and hard, pull out, dig up and re-sow. Begin transplanting with the first good rains, and continue as fast as the rains and planters will allow, until the crop is set out. Be careful to fill in the misses from previous transplanting before starting on new fields; use the stoutest and best plants for filling in, and try to get the tobacco from any one field to grow and come to maturity as near at the same time as possible. Discontinue filling in when the field has been planted for several weeks and has made a good start to grow, as the later filled in plants will be choked out by the earlier ones, and will not come to maturity. Cultivate fields as soon as plants are established, to keep down weeds.

VETERINARY.

Early heavy rains might bring on horse-sickness before its usual time, but as a rule it need not be feared till the first rains are over in December.

WEATHER.

The rains should be commencing, if not already begun; occasionally they have delayed until December, and even later, before setting in properly. Between spells of wet weather lasting several days, fine dry periods occur, at first clear, but later cloudy and thundery, gradually gathering to burst in thunderstorms. The mornings are generally fine, and rain falls chiefly in the afternoon or evening. Heavy downpours are to be expected, and should be provided against beforehand by means of ditches and embankments, and by clearing water ways and furrows.

In a normal season the rainfall varies from two-and-a-half to three inches in Matabeleland, and from three-and-a-half to four inches in Mashonaland generally, with the exception of the eastern border, where it amounts to five inches.

Between the rain periods and prior to the commencement of the rains, severe heat is likely to be experienced.

Seeds for Sale, Gwebi Farm.

		s.	d.
Salisbury White Maize	at per 100lb.	21	0
Salisbury White Maize (Tips and Butts),	at per bag of 200 lbs.	17	0
Kinvarra Oats	at per 100 lbs.	26	0
Ground Nuts (Spanish Bunch in Shell),	at per 75 lbs.	18	3
Majorda Seed	at per lb.	1	1
Sunflower Seed (Large Black)	at per 100 lbs.	16	0
Sunflower Seed (Small Black)	at per 100 lbs.	16	0
Sweet Potato Tubers (Calabash Leaf), available August and September	at per 150 lbs.	11	0
Sweet Potato Slips (Calabash Leaf), available December and January	at per bag	6	0
Napier Fodder Roots	at per bag	6	0
Edible Canna Tubers	at per 100 tubers	9	0
Dolichos Beans	at per 100 lbs.	21	0

All prices quoted are for *delivery free at any station or siding* in Southern Rhodesia. Before sending cheques, intending purchasers are advised to ascertain that the seeds, etc., required are still available. Cheques should be made payable to "Gwebi Farm." All orders and enquiries should be addressed to the Chief Agriculturist, Department of Agriculture, Salisbury, *not direct to the Gwebi Farm.*

Notes from the "Gazette."

"Gazette" Date.	*Items.*
	TRAFFIC REGULATIONS ACROSS BRIDGES AND CULVERTS.
19.9.30.	(1) No vehicle, the weight of which (including contents thereof) exceeds fifteen tons, shall be taken across any bridge or culvert on any road defined as a main, district or branch road, in terms of the "Road Regulations, 1896," whether declared or not. (2) No vehicle shall be taken across any bridge on any road as defined in the preceding section at a speed in excess of ten miles an hour. (G.N. 566.)
	IMPORTATION OF PLANTS.
19.9.30.	G.N. 382 of 1914 is cancelled and section 3 (4) of G.N. 259 of 1913 is amended by the substitution of the following sub-section in lieu thereof:— "(4) An examination fee of threepence for every ten packages or cases or any less number in a consignment, with a minimum fee of one shilling per consignment, will be charged, regardless of the number of classes of plant present, except in the case of consignments examined by the Plant Inspector, Bulawayo, when the minimum fee for examination shall be one shilling and twopence. In the case of plants calling for treatment, a fee of five shillings for each use of the fumigating chamber will be levied."
	POUND.
19.9.30.	A pound has been established on Sherborne Farm, Gwanda native district. (G.N. 577.)

Departmental Bulletins.

The following Bulletins, consisting of reprints of articles which have appeared in this Journal, are available for distribution free of charge to applicants in Southern Rhodesia only. Outside Southern Rhodesia, 3d. per copy.

AGRICULTURE AND CROPS.

No. 174. Notes on Hop Growing, by H. G. Mundy, F.L.S.
No. 225. Napier Fodder or Elephant Grass, by J. A. T. Walters, B.A.
No. 278. New Crops for Rhodesia, by J. A. T. Walters, B.A.
No. 362. The Cultivation of Rice, by H. G. Mundy, F.L.S.
No. 403. Florida Beggar Weed, by H. G. Mundy, F.L.S.
No. 429. Propagation of Kudzu Vine, by H. C. Arnold.
No. 442. Swamp or Irrigation Rice, by K. V. Yoshi, Bombay.
No. 510. Check-row Planting of Maize, by H. G. Mundy, F.L.S.
No. 513. The Carob Bean in Rhodesia, by J. A. T. Walters, B.A.
No. 541. The Potato Crop under Irrigation, by G. R. Syfret.
No. 545. Artificial or Synthetic Farmyard Manure, by H. G. Mundy, Dip.Agric., F.L.S.
No. 550. Onion Growing under Irrigation, by C. Mainwaring.
No. 561. Wheat Growing in Rhodesia, by C. Mainwaring.
No. 568. The Treatment of Arable Land, by G. N. Blackshaw, O.B.E, B.Sc., F.I.C.
No. 581. Leguminous Crops for Stock and Soil Improvement in Southern Rhodesia, by C. Mainwaring, Agriculturist.
No. 590. Rye, by H. W. Hilliard, Junior Agriculturist.
No. 591. Maize Export Conference Proceedings.
No. 598. Drought-resistant and Early-maturing Crops for Areas of Late Rainfall, by C. Mainwaring.
No. 599. Rhodesian Soils and their Treatment, by E. V. Flack.
No. 601. Maize for Export, by S. D. Timson.
No. 603. The Production of Maize in Southern Rhodesia, by C. Mainwaring, Agriculturist.
No. 630. The Storage of Seed Potatoes, by H. C. Arnold.
No. 634. Barley, by P. V. Samuels.
No. 643. Noxious Weeds in Southern Rhodesia, by F. Eyles, Botanist.
No. 650. Coffee Culture in Southern Rhodesia, by G. W. Marshall, Horticulturist.
No. 651. Two Important Leguminous Crops: The Velvet Bean and Dolichos Bean, by C. Mainwaring, Agriculturist.
No. 656. Tractor Notes, by A. W. V. Crawley, M.E., F.G.S.
No. 657. Hay-making in Southern Rhodesia, by C. Mainwaring, Agriculturist.
No. 663. The Use of Fertilisers and Manures in Southern Rhodesia, by A. D. Husband, A.I.C., Chief Chemist.
No. 672. Hay-making in Rhodesia, by H. G. Mundy, Dip.Agric., F.L.S.
No. 674. Top Dressing of Maize against Stalk Borer, by H. C. Arnold.
No. 681. The Sunflower (Helianthus Annuus) (Revised), by S. D. Timson, M.C., Dip.Agric.
No. 684. Warning to Maize Growers: Maize for Export.
No. 685. Notes on Farm Practice at the Government Farm, Gwebi, by S. D. Timson, M.C., Dip.Agric.
No. 694. The Edible Canna (Canna Edulis), by D. E. McLoughlin.

No. 695. The Castor Oil Plant (Ricinus spp.), by S. D. Timson, M.C., Dip.Agric.
No. 697. Results of Analysis of Samples taken under the "Fertilisers, Farm Foods, Seeds and Pest Remedies Ordinance" during the year 1927-28.
No. 700. Further Notes on Farm Practice at the Government Farm, Gwebi, by S. D. Timson, M.C., Dip.Agric.
No. 704. The Importance of Research on Pasture Improvement in Southern Rhodesia, by A. D. Husband, A.I.C., Chief Chemist.
No. 705. Suggested Cropping Programmes for Farms on the Sand Veld, by D. E. McLoughlin, Assistant Agriculturist.
No. 706. A Farmers' Calendar of Crop Sowings, by C. Mainwaring, Agriculturist.
No. 708. Witch Weed or Rooibloem (Striga Lutea)—a Serious Menace to Maize, by J. A. T. Walters, B.A., F.R.S.A., Agriculturist.
No. 709. Sand Veld Farming and its Possibilities, by E. D. Alvord, M.Sc. (Agr.).
No. 710. Monthly Reminders for the Farming Year, by the Division of the Chief Agriculturist.
No. 713. Ensilage, by J. A. T. Walters, B.A., Agriculturist.
No. 724. Ploughing by Tractor, by A. W. V. Crawley, M.E., F.G.S.
No. 727. Farmyard Manure, by A. P. Taylor, M.A., B.Sc., Agricultural Chemist.
No. 732. Two Common Diseases of Potato Tubers in Rhodesia, by J. C. F. Hopkins, B.Sc. (Lond.), A.I.C.T.A.
No. 743. Sunn Hemp, by S. D. Timson, M.C., Dip.Agric.
No. 750. Cotton in Southern Rhodesia—Hints to Growers, by G. S. Cameron, Empire Cotton Growing Corporation.
No. 751. The Sweet Potato, by S. D. Timson, M.C., Dip.Agric. (Wye).
No. 757. Maize on the Sand Veld: Results at the Tobacco Experiment Station, Salisbury, by C. A. Kelsey-Harvey, Manager.
No. 758. Instructions for Taking Soil Samples. Issued by the Division of Chemistry.
No. 759. Witch Weed (Striga Lutea): Methods of Control, by S. D. Timson, M.C., Dip.Agric. (Wye).
No. 762. The Value of Rock Phosphate and "Bone and Superphosphate" as Fertilisers for Maize Production, by A. D. Husband, Chief Chemist.
No. 768. The Ground Nut (Arachis hypogaea), by S. D. Timson, M.C., Dip.Agric. (Wye).
No. 775. Agricultural Costings at the Gwebi Farm, by H. G. Mundy, Dip.Agric., F.L.S., Chief Agriculturist, and J. Hick, Accountant.
No. 776. Regulations Governing the Export of Maize and Maize Meal through the Port of Beira.
No. 777. Some Aspects of Cost of Production Studies in Agriculture, by Arthur G. Ruston, D.Sc., Department of Agriculture, Leeds University.
No. 781. Agricultural Costings at the Gwebi Farm—Maize and Green Manuring, by H. G. Mundy, Dip.Agric., F.L.S., Chief Agriculturist, and J. Hick, Accountant.
No. 783. Agricultural Costings at the Gwebi Farm—Fattening for Beef, by H. G. Mundy, Dip.Agric. (Wye), F.L.S., Chief Agriculturist.
No. 787. Agricultural Costings at the Gwebi Farm—Ground Nuts and Maize and Beans for Silage, by H. G. Mundy, Dip.Agric. (Wye), F.L.S., Chief Agriculturist.
No. 793. Agricultural Costings on the Gwebi Farm, by H. G. Mundy, Dip.Agric., Chief Agriculturist.

Botanical Specimens for Identification.
Accelerating the Sprouting of Potatoes.

REPORTS ON CROP EXPERIMENTS.

No. 94. Second Report on Experiments, by J. H. Hampton.

No. 216. Manuring of Maize on Government Experiment Farm, Gwebi, by A. G. Holborow, F.I.C.

No. 220. Reports on Crop Experiments, Gwebi, 1914-15, by E. A. Nobbs, Ph.D., B.Sc.

No. 221. Results of Experiments, Longila, 1914-15, by J. Muirhead.

No. 239. Reports on Crop Experiments, Gwebi, 1915-16, by E. A. Nobbs, Ph.D., B.Sc.

No. 268. Manuring Maize, Government Farm, Gwebi, by A. G. Holborow, F.I.C.

No. 279. Report on Crop Experiments, Gwebi, 1916-17, by E. A. Nobbs, Ph.D., B.Sc.

No. 341. Report on Crop Experiments, 1918-19, Gwebi Experiment Farm.

No. 342. Rotation Experiments, 1913-19, by H. G. Mundy, F.L.S., and J. A. T. Walters, B.A.

No. 382. Annual Report of Experiments, Experiment Station, Salisbury, 1919-20.

No. 405. Annual Report of Crop Experiments, 1920-21, Gwebi Experiment Farm, by H. G. Mundy, F.L.S., and J. H. Hampton.

No. 411. Annual Report of Experiments, 1920-21, Experiment Station, Salisbury, by H. G. Mundy, F.L.S.

No. 413. Arlington Sand Veld Experiment Station, First Report, by H. G. Mundy, F.L.S., and E. E. Wright.

No. 432. Bulawayo Municipal Experiment Station, First Report, by H. G. Mundy, F.L.S.

No. 433. Winter Cereal Experiments, 1921, by D. E. McLoughlin.

No. 437. Annual Report of Crop Experiments, Gwebi Experiment Farm, 1921-22, by H. G. Mundy, F.L.S.

No. 440. Annual Report of Experiments, 1921-22, Experiment Station, Salisbury, by H. G. Mundy, F.L.S.

No. 485. Annual Report of Experiments, 1922-23, Agricultural Experiment Station, Salisbury, by J. A. T. Walters, B.A.

No. 486. Bulawayo Experiment Station, Annual Report for Season 1922-23, by H. G. Mundy, F.L.S.

No. 514. Bulawayo Experiment Station Report, 1923-24, by H. G. Mundy, F.L.S.

No. 519. Annual Report of Experiments, 1923-24, Agricultural Experiment Station, Salisbury, by H. G. Mundy, Dip.Agric., F.L.S.

No. 537. Crop Rotations on the Gwebi Experiment Farm, 1923-24, by H. G. Mundy, Dip.Agric., F.L.S.

No. 564. A Maize Rotation Experiment, by A. R. Morkel.

No. 566. Bulawayo Experiment Station, Annual Report for Year 1924-25, by H. G. Mundy, Dip.Agric., F.L.S.

No. 608. Annual Report of Experiments, 1924-25, Agricultural Experiment Station, Salisbury, by H. G. Mundy, Dip.Agric., F.L.S.

No. 631. Bulawayo Experiment Station : Annual Report for Year 1925-26, by H. W. Hilliard.

No. 649. Annual Report of Experiments, 1925-26, Agricultural Experiment Station, Salisbury, by H. C. Arnold, Manager.

No. 675. Bulawayo Experiment Station—Annual Report for Year 1926-27, by D. E. McLoughlin.

No. 683. Annual Report of Experiments, 1926-27, Agricultural Experiment Station, Salisbury, by H. C. Arnold, Station Manager.

No. 688. Report, 1923-24—1926-27, Gwelo Municipal Demonstration Stations, by D. E. McLoughlin.

No. 716. Report, 1927-28, Gwelo Municipality Demonstration Stations, by S. D. Timson, M.C., Dip.Agric.

No. 745. Salisbury Agricultural Experiment Station Annual Report, 1927-28, by H. C. Arnold.

No. 767. Gwelo Municipal Demonstration Stations. Annual Report for the Season 1928-29, by D. E. McLoughlin.

No. 773. Bulawayo Municipal Demonstration Station: Report for the Seasons 1927-28 and 1928-29, by D. E. McLoughlin, Assistant Agriculturist

No. 789. Agricultural Experiment Station, Salisbury: Annual Report of Experiments, 1928-29, by H. C. Arnold, Manager.

TOBACCO.

No. 605. Flue-curing Tobacco Barns, Bulking and Grading Sheds, by P. H. Haviland, B.Sc. (Eng.), Acting Government Irrigation Engineer.

No. 607. Tobacco Seed Beds, by D. D. Brown.

No. 615. The Culture of Virginia Tobacco in Southern Rhodesia—Field Management, by D. D. Brown.

No. 617. Dark Fire-cured Tobacco, by E. M. Matthews, B.Sc., Tobacco Adviser. Fire-curing Tobacco Barn, by the Tobacco Advisers.

No. 629. Notes on Flue-curing of Tobacco, by C. A. Kelsey Harvey.

No. 641. The Handling, Grading and Baling of Cured Virginia Tobacco, by D. D. Brown.

No. 644. Tobacco Baling Boxes, by B. G. Gundry, Irrigation Branch.

No. 653. The Care of Tobacco Seed Beds, by J. C. F. Hopkins, B.Sc. (Lond.), A.I.C.T.A. (Trinidad).

No. 661. Flue-curing Tobacco Barns, 12 ft. x 12 ft. x 16 ft., by B. G. Gundry.

No. 665. Tobacco Pests of Rhodesia, by Rupert W. Jack, F.E.S., Chief Entomologist.

No. 671. Wildfire and Angular Spot of Tobacco, by J. C. F. Hopkins, B.Sc., A.I.C.T.A.

No. 679. Tobacco Culture in Southern Rhodesia: The Harvesting and Curing of Virginia Tobacco, by D. D. Brown.

No. 689. The Lesser Tobacco Wireworms, by Rupert W. Jack, F.E.S.

No. 715. Turkish Tobacco Culture in Southern Rhodesia, by D. D. Brown, Chief Tobacco Expert.

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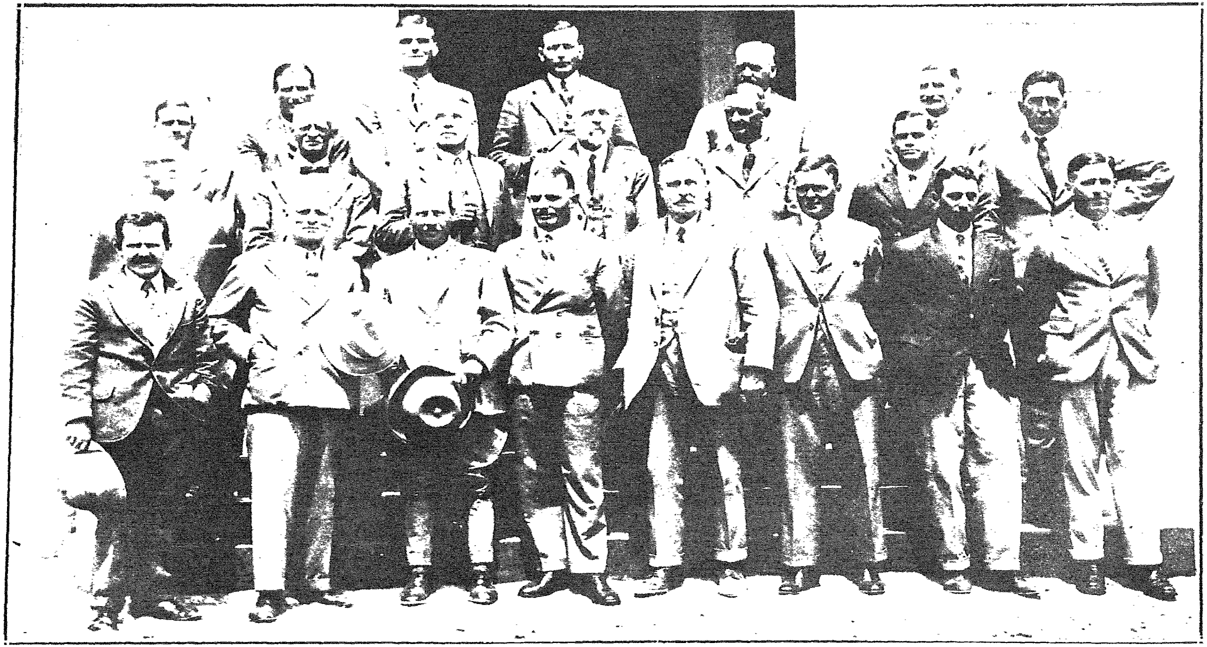

Monthly meeting of Umtali District Farmers' Association, 3rd October, 1930.

Front row, left to right: H. Tatham, P. C. Rutherfurd, Capt. R. G .Fox, I. Wilson, A. Howat (secretary), E. Palmer (chairman), J. H. Barry and E. Meikle (a vice-chairman).

Centre row, left to right: J. T. L. Bekker, W. H. Perrott, N. H. Chataway (Civil Commissioner and Resident Magistrate), Hon. L. Cripps, C. W. Blyth, D. Cripps and T. C. Hulley (a vice-chairman).

Back row, left to right: H. Cripps, J. Mungle, H. A. Cope Norris, L. T. Claisen, Col. Valentine and W. A. Bell.

THE RHODESIA

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Editor - - *William E. Meade.*

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Editorial.

Contributions and correspondence regarding subjects affecting the farming industry of Southern Rhodesia are invited. All communications regarding these matters and advertisements should be addressed to:—The Editor, Department of Agriculture, Salisbury.

The Umtali District Farmers' Association.—This Association is one of the oldest in the Colony, being formed on the 29th of October, 1898. It was then, and for many years after, styled the Manica Farmers' and Landowners' Association. The following were the first officials of the Association: President, Hon. C. J. Rhodes; chairman, L. Cripps; vice-chairman, J. Grimmer; committee, R. W. Cockerell, T. Brown, A. Partridge, A. Tulloch, D. McAdam, A. L. Bloech and J. H. Pickett; hon. secretary and treasurer, J. W. Corderoy.

Mr. L. Cripps (now Hon. Lionel Cripps) has been chairman several times during the long history of the Association, and has always taken a very active part in its affairs. Of the other members of the first committee, four are still alive, and three of them are residing in the district.

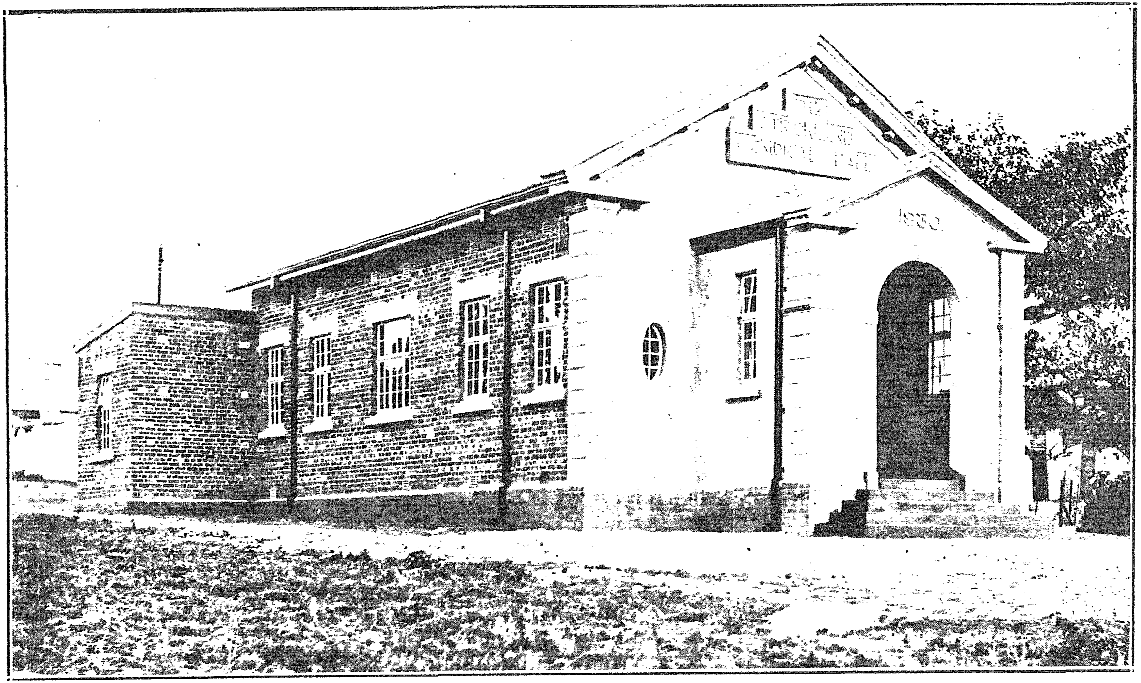
viz., Messrs. R. W. Cockerell, A. Tulloch and D. McAdam. Amongst the many who have been chairmen of the Association, the following are a few: Messrs. E. M. Webber, W. Deall, J. T. English, J. Meikle, T. B. Hulley, A. N. Strickland, D. Barry, Colonel Valentine, and Mr. E. Palmer, the present and youngest chairman.

The late Mr. T. B. Hulley was for many years an active member of the Association, and for some years was a member of the executive of the Rhodesia Agricultural Union. The late Mr. A. N. Strickland was an old and active member of the Association, being twice elected chairman.

Mr. D. Barry, who has been twice elected chairman, is an old and active member of the Association; he is also a member of the Rhodesia Agricultural Union executive. Mr. C. Eickhoff, M.L.A., who is at present in England, is a member of the Association and takes a keen interest in its affairs.

The Association has always taken an active part in the farming affairs of the Colony, and it has the credit of a large percentage of the resolutions it has sent up to the Rhodesia Agricultural Union Congresses being adopted by it.

The farmers' hall illustrated on the opposite page was erected by the Association in memory of the late Arthur Strickland, who died in January, 1928. The late Mr. Strickland was a prominent farmer of many years' residence in the district, and a man who was known and respected throughout the Colony. At the opening ceremony on the 4th July the Premier paid an eloquent tribute to the deceased gentleman, and said, *inter alia*, "He was known and loved by all with whom he came into contact. He was known and loved throughout the country by the natives as well as Europeans. Although he took no part in public life and avoided the limelight on every possible occasion, it is to such men as he that the country owes its present progress and prosperity. This hall will help to keep his memory green in the district which he loved so well, and will perpetuate hereafter the name of one who was greatly loved in his time and who played a great part in the development of the country. He was a farmer and a man of the land, and it is fitting therefore that farmers should meet in a hall bearing his name."



New farmers' hall at Umtali.

The hall is a very well built edifice, with a roomy interior suitable for assemblies, surmounted by a beamed ceiling of striking proportions supported on tasteful pilasters. In addition to the large hall, there are two living-rooms at the rear.

Rhodesia Agricultural Union Congress.—This annual gathering of farmers from all parts of the Colony representing the various associations comprising the Union is an event of the greatest importance in our economic life, and is regarded as such by Government and the community in general. It is the custom for His Excellency the Governor to open Congress, and for Ministers to be present when matters concerning their departments are under discussion. The President of the Union surveys the agricultural situation, resolutions concerning every phase of farming are submitted and Congress makes it perfectly plain in what manner it considers the industry can best be served.

The proceedings this year were in conformity with precedent, and during the three days of Congress there was a very thorough overhaul of the situation in general. We pay tribute to the many able speeches made and to the obvious fact that the farming community has in its ranks men of very considerable ability. We feel sure that the opinions expressed will carry great weight with Government and that the resolutions submitted will receive its careful consideration, though it must be recognised that it is not always possible to give effect to what is desired. Some impatience was expressed by delegates at the length of the debates, but in our opinion it is undoubtedly better to err in the matter of leniency than to restrict discussion.

As a result of the recent Congress there is unquestionably a clearer perception of what is needed to restore agriculture to its rightful place in the economic life of this Colony. It does not help to reiterate that the present depression is a world-wide phenomenon and that we must wait until it passes. The call is for action to see in what manner we can mitigate or render innocuous the incidence of the cycle of depressed prices through which we are passing. That there is nothing inherently wrong with Southern

Rhodesia as an agricultural country or with our methods of farming appeared to be accepted by delegates.

The dominant note of Congress was the need for organising the agricultural industry. There was an earnest desire to get together, to profit by past mistakes and by united effort to grapple with the many difficulties which confront the farmer to-day. It seemed to be realised that a constructive policy is needed, and that only by effective co-operation in every branch of agriculture as practised in this Colony can farming be made to pay. With recognition of this cardinal fact, the way, difficult though it is, should be much easier, and we trust that as an outcome of the very full discussions there will, without delay, be a concerted effort by all concerned to give effect to what Congress had in mind.

We publish elsewhere in this issue of the Journal the resolutions passed at Congress.

The Union Dairy Control Act, No. 35 of 1930.—This Act, embodying the principle of a levy of 1d. per lb. on all creamery and farm dairy butter manufactured and of cheese made in the Union of South Africa, came into force as from 1st October, 1930. It will be remembered that provision is made in this Act for all adjoining States and territories to co-operate with the Union by passing similar legislation. Unfortunately, such legislation, in so far as this Colony is concerned, cannot be passed until the next session of Parliament. In order to bridge the gap between 1st October and the passing of the necessary legislation, it has been proposed that Southern Rhodesia and other territories adjoining the Union should adopt a voluntary levy scheme for creamery butter manufactured in these territories. At a meeting held in Gwelo on the 14th October of representatives of creamery interests in Southern Rhodesia, it was unanimously agreed, pending legislation, to adopt this principle of a voluntary levy on creamery butter. This will have the effect of maintaining the *status quo* between Southern Rhodesia and the Union of South Africa as regards creamery butter—that is to say, there will be reciprocal free trade in creamery butter between this Colony and the Union. At this meeting it was considered impossible without necessary

legislation to adopt the principle of the levy on farm butter and cheese manufactured in Southern Rhodesia.

The export from Southern Rhodesia to the Union of farm dairy butter and of farm-made cheese is almost negligible, and it is felt that in the meantime, pending legislation, very little harm will be done if these products have to pay a levy of 1d. per lb. to the Union Customs authorities.

Warning to Tobacco Growers.—The following statement has been issued to the Press by the Department of Agriculture:—

> From information received it is feared that there may be over-production of tobacco leaf during the coming season, and the Government (with the advice of the Control Board, the Rhodesia Tobacco Association and the Board of the Rhodesia Tobacco Warehouse & Export Co., Ltd.) consider it necessary to warn all those who contemplate growing tobacco of this position.
>
> The market for tobacco of good grade is still limited, and the market for low grade tobacco is so small as to be negligible.
>
> The over-production of tobacco leaf can only result in loss to growers, who are warned to restrict their production within reasonable limits.
>
> The Government are prepared to make advances on leaf tobacco produced during the coming season.
>
> (1) These advances will be on a very conservative basis, and will only be made on the Union grades on Control Board Participation Certificates.
>
> (2) Excessive production will result in corresponding reduction in the advances.
>
> (3) The total advance made to any one grower will not exceed £350 sterling.

The Poultry Industry.—The Chief Poultry Officer, Mr. H. G. Wheeldon, has returned from his trip to England, where he attended the fourth World Poultry Congress held

at the Crystal Palace, and elsewhere in this issue of the Journal we publish some of the impressions gained by him during his visit overseas. The poultry industry is making rapid progress in all parts of the civilised world, and as the result of knowledge gained better methods of feeding, tending and housing are constantly being evolved. At the exhibition held in London the accumulated knowledge of the nations was expressed in a remarkable display of poultry and poultry appliances, and was a revelation to all that viewed it. At the lectures held concurrently with the exhibition every phase of poultry management was discussed, while delegates devoted eleven days to inspecting poultry plants in various parts of the United Kingdom. In this way our poultry officer had a unique opportunity of becoming acquainted with modern developments, and this knowledge will now be at the disposal of the poultry keepers of this Colony. We hope and believe that his visit to England will be of far-reaching importance to the local industry.

As most of our readers are aware, there has been a large surplus of eggs in Southern Rhodesia this year, and several consignments have been sent to the United Kingdom under the auspices of the Rhodesia Egg Circle. At the time of writing the results are not known. While in England Mr. Wheeldon investigated the possibilities of the Home market, and is of the opinion that during the period July-January, when European supplies are short, Rhodesian eggs should sell at a profit to the producer, providing satisfactory marketing arrangements are made. The Union of South Africa has for some years placed eggs on the Home market (47,250,000 in 1929), and, thanks to careful packing, proper grading and strict inspection at the ports, South African eggs have acquired a good reputation with the British consumer. We believe that prices have been satisfactory, and it is likely that the trade will develop. As our time of plenty coincides with the period of scarcity in Europe, there would appear to be good reason for the poultrymen in this Colony to co-operate with the authorities in the south with a view to participating in this trade, and we have no doubt that with the experience gained this year the Rhodesia Egg Circle will be in a position to give a lead in this matter.

Brush Fibre.—The following communication from Mr. A. Ingle, 119, Jameson Avenue, Salisbury, is published for general information: "I have been connected with the brush trade in South Africa for over twenty years. Recently I have been asked if I would endeavour to obtain any raw material in Rhodesia suitable for this work, and would be glad if you would pass on this request to your readers.

"I would be glad to hear from anyone who may have materials either on hand or obtainable that would be suitable for brushes of any kind. The long hair from cow tails, horse tails or manes, from four inches and upwards in length, can be taken in any quantity. It must be clean of foreign bodies, and if roughly tied up with pieces of string in small bundles as it is cut from the animal it is easier to handle and is more acceptable. Coarse fibre, such as the bottom end of sisal or Mauritius hemp leaves from six inches in length and more, can be used. It must be coarser than the ordinary sisal such as is used for rope-making, and the shorter leaf fibre is the most suitable. Fibres such as are used by natives for broom-making, or any fibre that is not too fine, may be useful, and samples would be appreciated.

"Where anyone has a quantity of palms growing, there is a fine fibre in the stem if beaten out that can be used, also the centre spine in the small fronds of the palm leaf. This at present comes from India, but if it is cut clean of the leafy material and tied in bundles, there is a good market for same.

"If samples are sent forward, I would gladly advise as to whether they are suitable or not, and if not, just what is needed in the preparation of same to make them marketable. It does seem a pity that there should be thousands of pounds sent oversea for materials of this kind if similar material is going to waste right around us."

"A World Cattle Shortage."—In various journals and periodicals which reach us this question is given considerable prominence and attempts made to appraise the world's supply of cattle in relation to the meat-eating population. Some think that a positive shortage of cattle is in sight, while

others consider that supply will advance with demand. Writers lay emphasis on the fact that beef cattle in the United States of America have declined in numbers, and the argument is advanced that the embargo on Argentine cattle will before long be raised, and supplies at present sent to the United Kingdom will then be diverted to that destination. Some authorities hold that the United States is capable of increasing production to supply all her domestic needs, and will do so if the present price level is maintained. The raising of the tariff against live cattle and imports of beef and veal certainly conveys the impression that the United States is not so dependent upon outside sources of supply as is thought, and is determined to encourage local production. By some it is contended that the population of the United States is increasing at such a rate that consumption will inevitably outstrip local supplies and that she will be compelled by force of circumstances to admit Argentine cattle. But is this so? According to the *Agricultural Outlook for* 1930, issued by the United States Department of Agriculture, it is pointed out that recent disclosures of a very marked decline in the birth rates in important countries of the world, including the United States, suggest that the total population can no longer be counted upon to increase in the future as steadily as it has in past decades. Assuming there is no change in the immigration laws, it is thought a stationary population may be reached in the United States within thirty years. A further factor is that the consumption of beef per capita in the United States is decreasing, and is made up by greater consumption of pork. It is worthy of note also that after a lapse of two years Canada has again started to send beef cattle to England on the hoof, and has apparently found the American tariff prohibitive.

If the British market is denuded of Argentine beef, a fine opportunity awaits the Dominions. But is such a position likely to arise in the not distant future? It is a very difficult question to answer, and the best that can be done is to weigh carefully the facts as available. It would help to a better realisation of the situation if the cattle population of the Argentine were known, but we shall have to wait until the census now being taken is made public before

authentic information is forthcoming. We know that the exports of chilled and frozen beef from Argentina to England have decreased by 26 per cent. during the past three years, and that there is a tendency for ranchers to turn to dairying and arable farming. There are, however, large reserves of high grade cattle in Uruguay which can be drawn upon to augment Argentine supplies should it be necessary, while Brazil has large stocks of cattle of inferior type which could probably be improved.

The whole position is obscure, but taking all the facts into consideration there would seem to be a possibility of a short supply of beef for the British market within the next few years, and we have written these notes with the object of directing the attention of cattlemen to the trend of events as we see them.

Exhibition of Wheat at Enkeldoorn.—A considerable quantity of wheat has been grown in the Charter district this season in moist vlei lands and in some instances with the aid of irrigation, and good acreage yields are recorded. A price of 28s. per bag for full truck-loads and 27s. 6d. for lesser quantities has been guaranteed by the millers for the current year, and farmers are thus assured of a good reward for their labours. In order to mark the occasion, and by healthy competition to stimulate interest in the crop as well as to improve the quality of the cereals grown in the district, arrangements are in progress for an exhibition at Enkeldoorn on the 26th November.

The exhibits will consist of one sack of milling wheat, to be judged on quality for milling purposes; one sack of seed wheat to be named, to be judged on purity, soundness and plumpness; one sheaf of wheat; one sheaf of oats, and any other cereals. All exhibits, in addition to bearing the name of owner and the farm, must be further labelled to show (1) whether the crop was grown under irrigation, (2) whether it was grown in vlei lands, (3) whether manure or fertiliser was applied to the land, (4) the approximate yield per acre, (5) the quantity grown during the year 1930.

The official opening of the exhibition will take place at 11.15 a.m., and from noon to 1 p.m. lectures will be given

by officers of the Department of Agriculture. In the afternoon a sale of cattle will be held.

We trust this exhibition will receive the support it deserves from farmers of the district and neighbouring wheat growing areas. All information required will be supplied by the Civil Commissioner at Enkeldoorn.

Tobacco Gifts for Friends Overseas—Christmas, 1930.—Arrangements have been made with the office of the High Commissioner for Southern Rhodesia, London, for the despatch of Rhodesian cigarettes and tobacco post paid to addresses in the United Kingdom and Northern Ireland.

It is thought a considerable number of residents in this Colony would like to take advantage of this scheme to present their friends in the United Kingdom and Northern Ireland with suitable gifts for Christmas at a moderate charge.

The choice in pipe tobaccos covers six brands of various strengths packed in containers of one to four ounces at an average cost of 1s. per ounce post paid, and there are seven brands of Virginia and three brands of Turkish cigarettes, ranging from packets of ten to one hundred, at an average cost of 4s. 7d. and 7s. 1d. per hundred respectively, postage paid.

Full details of brands of cigarettes and tobaccos, including cost delivered under this scheme, may be had on application to the Acting Secretary, Department of Agriculture and Lands, who is prepared to accept orders for transmission to the High Commissioner.

No order will be transmitted unless accompanied by the required remittance.

Government Assistance to Maize Growers in Southern Rhodesia.

The Government has decided to make available to maize growers who require assistance to enable them to carry on their farming operations for the coming year loans on the following terms:—

Advances will be limited to such an amount as, added to the prices received or estimated to be received on this year's crop, will bring the total up to 8s. per bag to the grower. It has been decided that this rule may be relaxed to the extent that the advances may be increased by not more than 50 per cent. to those farmers who adopt sound methods of cultivation, the reference being to the conservation and promotion of the fertility of the soil by green manuring.

The method of repayment which has been adopted is that for every £ advanced the grower shall hand over to the Government one bag of maize per annum for three years, which will be accepted as full payment for the loan, i.e., three bags in all. The Farmers' Co-op. will be asked to accept this grain in their pool.

Any excess in price over the sum of £1 received for the three bags of this maize will be returned to the grower. It is thought that no doubt in some cases the grower will prefer to repay in cash, and this will be provided for, the loan being on the basis that no interest is charged. Applicants will be required to furnish the committee dealing with these loans with full information as to their financial position, and, if necessary, certified balance sheets.

The committee that has been appointed to make these loans, and which will have full discretion in the allocation, consists of Major R. H. Everett, C.B.E., the late Auditor General; Major H. G. Mundy, the Chief Agriculturist; with Mr. A. W. Redfern, the manager of the Land Bank, as

adviser. The secretary of the committee is Capt. E. E. Burt.

Sittings will commence on Monday, 27th October, at 10 a.m. in the Legislative Assembly building, and will continue there for one week.

In order to meet the convenience of farmers in the main maize districts, in the following week it is proposed that one day shall be spent at Bindura, one day at Glendale, one day at Amandas and one day at Sinoia, and also one day between Hartley and Gatooma.

Further information regarding these sittings will appear in the weekly issue of the *Rhodesia Herald* of 31st October.

Provision will be made that any loans given by the Government are not utilised to satisfy existing creditors other than native labourers. This loan is temporary assistance. The question as to the more permanent assistance to the industry is to be dealt with by a committee, replies from the proposed members of which are being awaited by the Minister of Agriculture and Lands. The existing bounty, in connection with which £25,000 was provided in the Estimates, and which is now estimated to cost £40,000 (the estimated export being approximately 800,000 bags, i.e., 300,000 more than was originally provided for), will not be affected by this arrangement.

An Appreciation.

A subscriber in Northern Rhodesia writes: "I should like to say how much this Journal is appreciated by myself and all my neighbouring farmers—and acted upon."

Green Manuring.

AN ESSENTIAL PRACTICE IN RHODESIAN FARMING.

By H. G. Mundy, Dip.Agric. (Wye), F.L.S., Chief Agriculturist.

Green manuring has consistently for the past ten years been recommended to Rhodesian farmers as a means of restoring and maintaining soil fertility. Its advantages and the remarkable results which follow the practice have been demonstrated year in and year out on the Government farms and experiment stations, and a few farmers have conclusively proved its merits for themselves.

Green manuring is no new discovery of modern science. Its importance and value have been recognised by the ancient civilisations of the East for the last two thousand years, and amongst the densely settled rural populations of India and China, with their comparative scarcity of animal manure, the use of vegetable matter and leguminous plants and leaves for turning into the soil as a means of enrichment of the land is an accredited practice.

Vegetation or vegetable residues, decomposed in the soil, are converted into organic matter or humus, and an adequate supply of this material is essential to the maintenance of soil productivity. In many countries it is possible to maintain this supply in the land by the usual farming practices, such as the application of farm manure with which is incorporated straw and other litter, by periodically laying down the land to temporary pastures and by growing in the adopted rotations fine-strawed and other crops which leave a generous stubble or aftermath to be ploughed under or which are fed off direct by live stock.

It has required no great gift of imagination to foresee that such practices were not generally applicable to Rhodesia. The amount of land annually under crops is far in excess of that which can be treated with sufficient frequency with farm manure. Temporary pastures, laid down for two or three years, are not a practical expedient; land cannot economically be seeded on any appreciable scale to crops for feeding off by stock, and straw and hay crops and clovers and lucerne do not at present figure largely in our farming economy. It is due to these limitations that so much of the work of the Rhodesian experiment farms and stations has been devoted to investigations in connection with green manuring.

What is Meant by Green Manuring.—The term "green manuring" is often wrongly applied, and its best definition would seem to be the turning down of green, unrotted vegetable matter into the soil.

Often the expression "green soiling" is used when really green manuring is meant. The former term, however, is generally accepted to imply the cutting of a crop green and the feeding of it in that condition to live stock. Cover cropping is also confused with green manuring. The two are not necessarily the same, and to avoid confusion it may be well to regard a cover crop as one subsidiary to the main crop, under or over which it is planted with the object of (a) making more profitable use of the land, (b) checking soil erosion, (c) shading or sheltering the major crop, (d) providing material to be utilised later as a green manure.

In its literal sense, green manuring would embrace the ploughing under of all plant material, including grass and weeds; but to be more explicit, it is well to confine the term to those occasions when a crop has been specially sown or is specially used for the purpose. It need not, however, have been grown primarily with the object of green manuring, for, though this is not usually the case in Rhodesia, earlier growths may be harvested or fed off the land and only the final growth may be turned under.

The Part Played by Humus in the Soil.—It may well be asked why the maintenance of a sufficient supply of humus in the soil is so important. The following are some of the reasons:—

1. Humus is capable of absorbing large quantities of water without giving this up rapidly through drainage or evaporation. Thus a soil well supplied with humus is less adversely affected by drought or excessive rainfall than one poorly supplied.

2. Humus improves the physical character of a soil and thereby the tilth. It renders close, heavy land more porous and friable and more easily worked, and its addition to light sandy soils increases their ability to retain moisture and converts them to something more nearly equivalent to a loam.

3. Humus is one of the chief reservoirs of nitrogen in the soil, and unless it is present in sufficient quantity, the activities of the nitrogen fixing bacteria are greatly impaired. The carbon dioxide liberated from the organic matter in this fixation of nitrogen assists in rendering more readily available to plants the mineral foods contained in the soil.

4. Carefully planned investigations in Southern Rhodesia, supported by the testimony of many prominent farmers, indicate that in the absence of a sufficiency of humus, artificial fertilisers are powerless to exert their best and most remunerative effect, and it is now becoming generally recognised that the application of chemical fertilisers to a soil deficient in organic matter is only waste of time and money.

5. In addition to supplying the soil with humus, green manuring plays another very important part, and one which should constantly be remembered when ways and means of cheapening production costs are under consideration. If suitable varieties are selected, the green manure crop, by reason of the dense shade which it throws and its smothering effects, can be made a cleaning crop which will reduce the occurrence of weeds during the next season or two, and thus effect a subsequent saving in the labour bill.

6. Green manuring, or the growing of cover crops under the major crop, also affords valuable temporary protection from soil erosion—so potent a factor in reducing the productivity of many farms and plantations; and this applies especially to those zones where the principal crops of the country are grown in drills or rows under conditions of clean cultivation, as is the case with maize, tobacco, cotton, ground

nuts, and so forth. Virgin soil ploughed for the first time, and containing large supplies of rotted and unrotted organic matter, suffers less from erosion than a similar soil which has been worked for a number of years and is depleted of organic matter. A cover crop under maize or a green manure crop in a citrus grove protects the land from erosion while it is growing, and when ploughed in and partially decomposed, it continues for a time to exercise similar beneficial effects.

7. Leguminous crops, which are those usually chosen for green manuring, are deep rooting and have well developed tap roots. These deep feeding roots draw upon food supplies inaccessible to surface feeding plants, and when they decompose, place this food in a readily available form for the use of subsequent crops. Similarly these deep roots penetrate the lower soil levels, and in their decay, soil-aeration, moisture-absorption and drainage are improved, while conditions are made more favourable for root-penetration of the crops which succeed them.

8. By the choice of suitable legumes, green manuring can place large amounts of nitrogen in the soil, distinct from that obtained from the decaying crop residue. Those legumes which freely develop root-nodules, due to the presence in the soil of the necessary bacteria, are said to be able to draw as much as two-thirds of their total nitrogen content from the air, and periodical green manuring, in addition to all the other benefits which it confers, thus enables the farmer to feed his fields with nitrogen obtained from the air instead of purchased at a high price from the fertiliser factory.

Organic Matter is Rapidly Lost.—There is no doubt that, whatever may be true of other countries, the dissipation of organic matter in Rhodesian soils is very rapid. This may perhaps be attributed to the action of termites and to the burning effect of the sun during the long, dry months of winter. Certain it is that here, even the best virgin soil very quickly becomes impoverished of humus, and when this stage is reached, fails to produce satisfactory crops or to respond to artificial fertilisers. Under such conditions—and unfortunately it must be admitted that a large percentage of the arable land of the Colony has already been reduced to this stage of humus starvation—the only practical

Fig. 1.

Maize and Sunn hemp on the plot in the rotation trials which had previously grown maize for 15 years in succession. The last maize crop yielded 1.9 bags per acre. In 1928-29 the whole plot was dressed with 250 lbs. per acre of bone and superphosphate, and one half was sown to maize, and the other to Sunn hemp and velvet beans for green manure. The maize yield was 6.2 bags per acre. Salisbury Experiment Station.

Fig. 2.
Compare with fig. 1. The maize on the right follows the Sunn hemp and velvet beans ploughed under. That on the left follows the maize which the previous year received 250 lbs. per acre bone and superphosphate. Yield: After green manuring, 15.87 bags per acre; after maize, 11.44 bags per acre. Salisbury Experiment Station, 1929-30.

Fig. 3.
Maize and tobacco, both after a mixed crop of velvet beans and cowpeas

remedies are heavy applications of farm manure or a green manuring. As already stated, supplies of animal manure are totally inadequate for the needs of these lands, and the only effective alternative by means of which fertility can be restored, lies in a widespread adoption of green manuring.

Experimental Results from Green Manuring.—Many of the investigations on the Salisbury Agricultural Experiment Station afford striking proof of the value of green manuring, but space does not permit of more than one or two being quoted. The results over one series of four plots are typical. On three of the plots each year maize is grown—one plot each year receiving 150 lbs. of phosphatic fertiliser per acre—while on the remaining plot velvet beans are grown. The fertiliser, up to 1928-29, was always applied to the second crop following the green manuring.

The returns from the green manured and fertilised sections have been as follows:—

Yield in Bags (203 lbs.) of Maize per Acre.

Section.	1919-20	1920-21	1921-22	1922-23	1923-24	1924-25	1925-26	1926-27	1927-28	1928-29	1929-30
No. 1	23.1*	25.9	G.M.	18.8	11.5*	6.65	G.M.	17.90	14.50*	8.75	G.M.
No. 2	23.0	24.6*	11.7	G.M.	13.0	19.85*	13.8	G.M.	14.70	9.0*	5.7
No. 3	G.M.	28.7	12.7	17 4	G.M.	15.65	15.8*	14.2	G.M.	17.5	7.5*
No. 4	19.2	G.M.	14.5	21.1*	9.6	G.M.	20.2	14.7*	7.8	G.M.	16.0†

*Indicates the application of 150 lbs. of phosphatic fertiliser that year.
†Received 200 lbs. per acre superphosphate in 1929-30.

As may be seen from the first season's returns, the soil was in a very satisfactory state of fertility when the experiment started, and the treatment accorded the land has not been sufficient to maintain this fertility. Subsequent experiments have shown—as was expected would be the case—that the applications of artificial fertiliser have been inadequate. The enquiry, however, was planned to investigate the value of green manuring, and from this point of view it is interesting to note the following points:—

(a) In five years out of the nine the return from the unfertilised maize immediately following the green manuring has been greater than the return from the maize to which fertiliser is applied and

which follows two years after the green manuring.

(b) With two exceptions, the yields from the maize which follows three years after the green manuring have been consistently the lowest each year in the series.

The next table serves to illustrate the manner in which soil depleted of organic matter fails to respond to artificial fertilisers, and the effect of various manurial treatments upon the crop returns obtained during the seasons 1919-20 to 1924-25:—

Maize Yields after Various Fertiliser and Green Manuring Treatments.

Manurial treatment of land during seasons 1919-20 to 1924-25.	Yield of maize. Number of bags (203 lbs.) of grain per acre.		Total yield of maize per acre (number of bags) over period commencing season 1919-20 and ending season 1924-25 (six seasons)
	Season 1920-21	Season 1924-25	
1. Never manured or fertilised	15 1/5	1½	48⅔ *
2. Three dressings of fertiliser applied in 1919, 1921, and 1923 respectively (a)	18½	5½	70¾ †
3. Green manured in 1919-20; never fertilised	25 1/5	7⅛	69¾ ‡
4. Green manured in 1919-20; two dressings of fertiliser applied in 1921 and 1923 respectively (b)	25 1/5	12⅛	80 §
5. Green manured in 1919-20 and 1923-24; never fertilised	25 1/5	13 1/5	65⅛ ‖
6. Green manured in 1919-20 and 1923-24; one dressing of fertiliser applied in 1921 (c)	25 1/5	16 1/10	74⅔ ¶

*Combined yield of six maize crops, 1920-21-22-23-24-25.

†Combined yield of six maize crops, 1920-21-22-23-24-25.

‡Combined yield of five maize crops, 1921-22-23-24-25. Land green manured in 1920.

§Combined yield of five maize crops, 1921-22-23-24-25. Land green manured in 1920.

‖Combined yield of four maize crops, 1921-22-23 and 1925. Land green manured in 1920 and 1924.

¶Combined yield of four maize crops, 1921-22-23 and 1925. Land green manured in 1920 and 1924.

(a) Expenditure on fertilisers at their current prices during years of application, 57s. per acre.

(b) Expenditure on fertilisers at their current prices during years of application, 34s. 5d. per acre.

(c) Expenditure on fertilisers at their current prices during years of application, 17s. 3d. per acre.

The results are so conclusively in favour of green manuring that little comment is necessary. However, it will be noted that in spite of three applications of fertilisers within the period of six years, the productivity of the land on plots grouped under No. 2 had fallen to a lower standard by the end of the period than the plots in group No. 3, which had received only one green manuring and no artificial fertilisers.

Comparing groups Nos. 4 to 6, it will be seen that at the end of the six years the plots twice green manured and receiving only one dressing of artificial fertilisers, costing 17s 3d. an acre, were in an appreciably higher state of fertility than the plots once green manured and twice treated with artificial fertilisers. Finally, the plots twice green manured and which in consequence only grew four crops of maize, in the aggregate produced only five and one-third bags of maize less in the six years than the plots green manured only once, and which in the period therefore grew one additional crop of maize.

The only exception of importance to the principle enunciated by these results, over a number of years on the experimental stations, is illustrated in fig. 2. Here the plot continually under maize for seventeen years responded well last season to bone and superphosphate applied in 1928-29, and green manuring on the other half of the plot has not shown as large an increase as was expected. The explanation for this cannot at present be offered, but the yields from the two plots during the next two to three years may provide one.

Green Manuring on the Tobacco Experiment Station, Salisbury.—A number of green manuring experiments have also been conducted on this station both with tobacco and other crops, but a few examples of the results must suffice.

In one trial on very poor, light sandy soil, the effect of a summer fallow was compared with (a) a green manuring with a combined crop of Sunn hemp and sunflowers, and (b) a combined crop of velvet beans and kaffir beans. The year following the green manuring, maize, with 150 lbs. per acre bone and superphosphate, was planted on all plots, 3 feet by 3 feet apart, four kernels to the "hill," the two most vigorous plants being left to mature. The results were as follows, under a rainfall of 21.45 inches:—

Treatment previous year, 1928-29.	Yield of maize in bags per acre.
Sunn hemp and sunflower ploughed under	10.24
Kaffir beans and velvet beans ploughed under	11.50
Summer fallow of weeds and grass	4.26

The growth of the maize and tobacco crops in this trial is illustrated in figs. 1 and 2 of the illustrations.

Tobacco following a Green Manure.—Fear has been expressed in some quarters that green manuring with legumes before planting tobacco may cause too heavy a leaf, difficult to cure. On one series of plots tobacco was grown in a four-course rotation, consisting of—1925-26, tobacco with 200 lbs. per acre double complete tobacco fertiliser; 1926-27, tobacco with 150 lbs. per acre No. 4 tobacco fertiliser (blood meal); 1927-28, ground nuts without fertiliser; 1928-29, velvet beans ploughed under.

In 1929-30 the green manured area, divided into 12 plots, was planted to Hickory Prior tobacco, which received 200 lbs. double complete fertiliser before planting and 50 lbs. of the same fertiliser as a top dressing four weeks after planting. The soil was a light granite sand and the rainfall for the season was 21.45 inches. Fig. 7 illustrates the growth of the crop. The average yield from the twelve plots was 1,187 lbs. per acre, and the leaf found a ready sale for export at an average price of 11d. per lb. The average percentages of the different grades of tobacco were as under:—

Brights.	Medium brights.	Mediums.	Darks.	Greens.
3%	10%	53%	28%	6%

In another rotation experiment, two crops of fertilised tobacco were followed by a crop of mixed maize and velvet beans for silage, and in the fourth year a crop of velvet beans ploughed under. In 1929-30 the green manured area was divided into ten plots planted to Hickory Prior tobacco with 200 lbs. of double complete fertiliser applied before planting. The soil was similar to that described under the previous experiment, and the following table gives the yield per plot and the analysis of the grades of tobacco finally cured:—

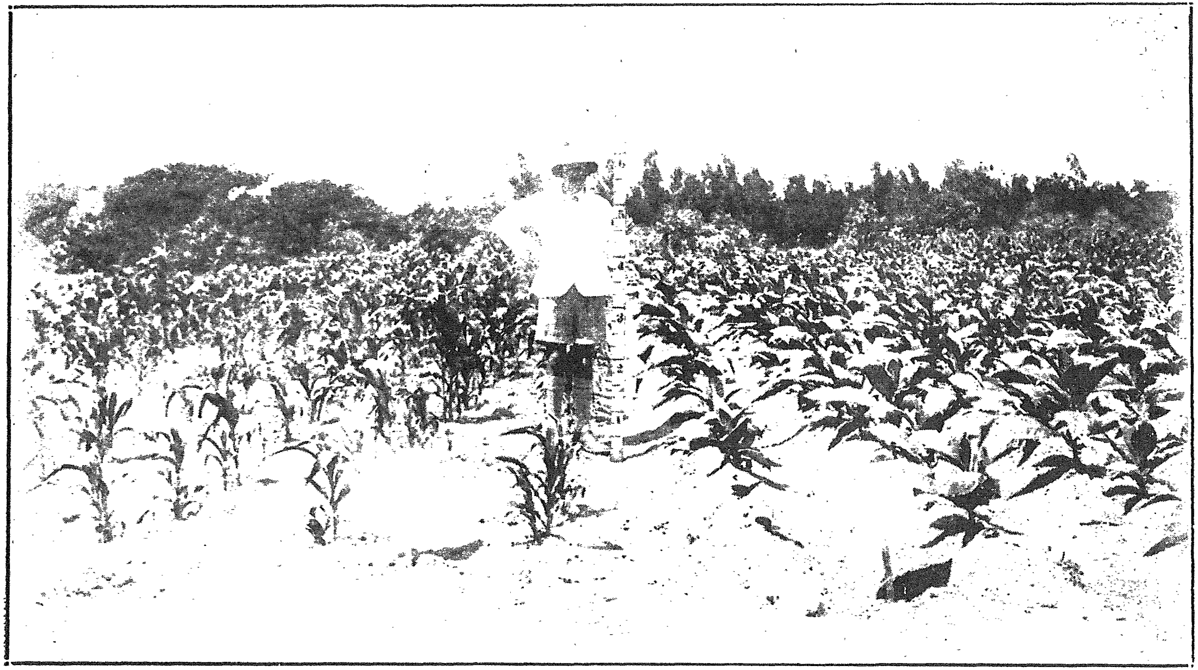


Fig. 4.

Maize and tobacco, both after a summer fallow the previous year. Compare with fig. 3. Tobacco Experiment Station, Salisbury.

Fig. 5.
Cowpeas (kaffir beans) planted under maize at the time of the last cultivation and ploughed under after maize was cut and stooked. The maize yield the following season was 14.40 bags per acre, as against 11.74 bags from plots where beans had not been under-sown. Tobacco Experiment Station, Salisbury.

Yields and Grades of Tobacco Obtained after a Green Manuring with Velvet Beans.

Plot.	Yield in lbs. per acre.	Analysis of grades.				
		Brights.	Medium brights.	Mediums	Darks.	Greens.
		Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
1	946	4	25	40	18	13
2	1,056	2	21	49	24	4
3	990	0	1	69	26	4
4	896	0	4	76	15	5
5	918	8	18	52	12	10
6	896	6	41	32	12	9
7	882	5	14	47	28	6
8	1,030	3	18	47	29	3
9	888	14	17	41	24	4
10	944	0	24	55	20	1

The Effects of Under-Planting Maize with Cowpeas.—The final table given below shows the maize yields obtained in 1929-30 after a maize crop in 1928-29 (a) under-planted with cowpeas at different dates, (b) not under-planted with cowpeas. The object of the experiment was twofold, namely, to ascertain the most suitable date for under-sowing the legume, and to ascertain the effect of ploughing under the legume after the maize had been cut and stooked.

Cropping, 1928-29.	Cropping, 1929-30.	Yield of maize in bags per acre, 1929-30.
Maize plus 150 lbs. bone and supers per acre, underplanted with kaffir beans.	Maize plus 150 lbs. bone and supers per acre, underplanted with kaffir beans.	
Time at which underplanted crop was sown.	Time at which underplanted crop was sown	
When maize was 4-6 inches high (poor growth of kaffir beans)	When maize was 4-6 inches high (poor crop beans)	11.05
After first cultivation (fair growth of kaffir beans)	After first cultivation (poor crop beans)	13.51
After second cultivation (poor growth of kaffir beans)	After second cultivation (poor crop beans)	9.57
After last cultivation (excellent crop of kaffir beans)*	After last cultivation (good crop beans)	14.40
No legume planted under maize crop	No legume planted under maize crop	11.74

*The growth of kaffir beans in 1929 on this plot is illustrated in fig. 5 of the illustrations.

It is considered that the higher yields of 13.51 and 14.40 bags of maize per acre reaped in 1929-30 can fairly be attributed to the heavier growth of beans made on these plots and ploughed under in the previous season.

Statistical Figures Showing the Value of Green Manuring.—With the kind consent of the Government Statistician, statistical figures bearing on green manuring, which have not yet been made public in a report of the

Statistical Bureau, are permitted to be given. The following are extracts from a report shortly to be published:—

"One of the most striking features in the year under review—1929-30—was the increased acreage planted to green manure crops. The increase amounted to 7,420 acres, or 86.6 per cent., compared with an increase in 1927-28 of only 473 acres, or 5.8 per cent. The land so utilised was 3.9 per cent. of the total area under cultivation, compared with 2.2 per cent. in 1927-28. The greatest increase was in leguminous crops, and of these, Sunn hemp accounted for nearly one-half of the whole increase. Among non-leguminous plants utilised, sunflower is the most popular, the acreage recorded being second only to Sunn hemp.

"In the following table, maize growers are analysed for the four seasons 1925-26 to 1928-29 into four groups. Group I. consists of those who have used green manure crops in each of the four seasons analysed, Group II. of those who have used green manure once, twice or three times during the same period, Group IV. comprises only farmers who have never used green manure, while Group III. is a combination of the other groups, i.e., all growers of maize, whether using green manure or otherwise.

MAIZE GROWING AND GREEN MANURING.

Period.	All growers who used green manure during the four seasons 1925-26 to 1928-29. Regularly I.	All growers who used green manure during the four seasons 1925-26 to 1928-29. Not regularly. II.	All maize growers. III.	All growers who have not used green manure during any of the four seasons analysed. IV.
	No.	No.	No.	No.
No. of growers.				
1925-26	22	137	1,856	1,697
1926-27	22	146	1,971	1,803
1927-28	22	162	2,099	1,915
1928-29	22	320	2,282	1,940
Area planted to maize.	acres	acres	acres	acres
1925-26	8,884	26,327	239,662	204,451
1926-27	9,482	33,154	267,354	224,718
1927-28	9,700	40,780	295,290	244,810
1928-29	11,625	77,273	325,329	236,431
Area planted to green manure.	acres	acres	acres	acres
1925-26	1,294	5,481	6,775	...
1926-27	1,912	5,158	7,070	...
1927-28	1,871	5,816	7,687	...
1928-29	2,421	13,361	15,782	...
Total yield of maize (grain).	bags	bags	bags	bags
1925-26	75,803	199,558	1,393,654	1,118,293
1926-27	87,676	268,131	1,659,597	1,303,790
1927-28	67,351	230,944	1,268,100	969,805
1928-29	98,308	537,245	1,826,345	1,190,792
Yields per acre (maize grain).	bags	bags	bags	bags
1925-26	8.53	7.58	5.82	5.47
1926-27	9.25	8.09	6.21	5.80
1927-28	6.94	5.66	4.29	3.96
1928-29	8.46	6.95	5.61	5.04
Yield per acre for each group expressed as a percentage of Group III.	per cent.	per cent.	per cent.	per cent.
1925-26	146.6	130.2	100.0	94.0
1926-27	148.9	130.3	100.0	93.4
1927-28	161.8	131.9	100.0	92.3
1928-29	150.8	123.9	100.0	89.8

Fig. 6.
Green manure trials: Maize under planted with white jack bean.

"From the above table several very enlightening features are disclosed, in addition to the small proportion of maize farmers who green manure their lands, which fact has already been commented on.

"*Group I.*—The percentage acre yield in this small group is steadily increasing, and on the average, these farmers obtain a 50 per cent. higher return per acre than that obtained in the Colony generally. The most striking feature, however, in this group is the fact that in a bad season those farmers who had consistently green manured their lands were not so adversely affected as maize growers in general, their acre yield for 1927-28, when compared with that for the Colony as a whole, being nearly over 62 per cent. instead of 50 per cent. higher. This is a striking proof of the value of previous green manuring in a season of low acre yields.

"*Group II.*—Here again the value of green manuring is proved, for although the application of this form of soil enrichment has not been consistent among this group, the acre yield is steadily increasing, and averages 30 per cent. more than that obtained in the Colony as a whole. The drop in the percentage of the acre yield for the season 1928-29 is due to the large increase in the number of farmers who planted green manure crops in that season, most of them for the first time. Their maize crops, grown on impoverished lands, are included in the total of this group, while the effect of the green manure crops planted during 1928-29 will not be noticeable until later.

"*Group IV.* provides striking evidence of the folly of continually cropping land without replacing its productive qualities. Not only do these farmers obtain acre yields averaging nearly 10 per cent. less than the average acre yield for the whole Colony, but their average acre yields have actually decreased by 5 per cent. during the four seasons analysed. The financial benefit of the regular use of green manure crops, as compared with their non-use, can be appreciated from the following figures deduced from the previous table and other information:—

	Total production in four seasons	Value at 10s. 10d. per bag, being average pay-out of the Farmers' Co-op., Ltd., for the period	
		Total.	Per acre planted to maize.
	Bags.	£	s. d.
Total production of farmers in Group I. who green manured their land regularly during the seasons 1925-26 to 1927-28 inclusive	329,138	178,283	89 . 10
Production from the same acreage if no green manure had been used, at the average acre yield obtained by Group IV. ...	198,445	107,495	54 . 2
Extra production, mainly due to use of green manure	130,693	70,788	35 . 8"

What Practical Farmers Think of Green Manuring.—The following expressions of opinion from Rhodesian farmers in all parts of the Colony who have practised green manuring for a number of years may be more convincing to some readers than the experimental and statistical data previously given:—

"The question of green manuring is one which is bound to come before a farmer who finds his yields are decreasing. While admitting the necessity of it, he usually puts it off, fearing a loss of income. In actual practice, I doubt whether the loss is as great as is anticipated.

"New land may be brought under cultivation to make up for that which is green manured, or an increased yield from the better working of a smaller acreage will help to minimise the loss.

"Two years of green manuring have convinced me that it is a paying proposition, and under no consideration would I throw it out of my farming operations.

"W. H. DODD, Banket."

"Sunn hemp ploughed under during summer on irrigated lands intended for wheat and other winter crops is, I consider, absolutely necessary.

"Irrigation water carries a considerable number of weed seeds, and weeds such as wild gooseberry and stink blaar can ruin a wheat crop unless they are exterminated by a dense crop of Sunn hemp. I have found no better form of fertiliser for wheat and barley than Sunn hemp ploughed under, combined with basic slag.

"Winter wheat following a summer crop of Sunn hemp with 250 lbs. of basic slag per acre yielded 14.8 bags per acre. A continuation of this same land was stumped, and the following year (1930) was seeded to wheat. It has not received a green manuring, but was ploughed three times and given an application of 120 lbs. per acre of complete wheat fertiliser. The crop has not yet been reaped, but it is very poor and not likely to exceed 4 bags an acre. The portion which was Sunn hemped the year before is again under wheat and is expected to reach its previous yield of over 14 bags an acre.

"Green manuring aids irrigated farming by keeping the soil friable and free from packing and cracking, and the land is made easier to work.

"A warning should be given about over-doing green manuring. Once in three years is usually sufficient, otherwise the crop, in the case of small-grained cereals, will lodge without an increased yield, and in the case of potatoes, excess of tops and late maturing are encouraged.

"G. R. Syfret, Salisbury."

"It has become painfully evident that in Southern Rhodesia we have been gradually robbing our lands by not returning an equivalent of what we take out. Owing to the large acreage cultivated by maize growers, it is impossible to supply the necessary humus by the addition of kraal manure. The practice of green manuring has only become fairly general in Rhodesia of recent years.

"My own observations, covering some seven or eight years of green manuring, lead me to believe that on the top of a dressing of rock phosphate and ploughed in at the right time, the fertility of most of our lands can be maintained by this practice.

"The acid generated by the decomposition of the green crop evidently assists in a marked degree in making the rock phosphate available.

"I would go so far as to say that a farmer omitting to green manure in Rhodesia as part of his rotation must sooner or later go out of business.

"J. M. Moubray, Shamva."

"I am a great believer in the practice of green manuring, preferably with an application of 250 to 400 lbs. of phosphatic fertiliser at the time of sowing the green crop. In my opinion a moderately fertile soil (such as at Glendale) after the above treatment should not yield less than 20 bags an acre, coming down to an average of not less than 10 bags an acre for the next three years, when the land should be green manured again. I need not mention that good farming methods and average good seasons are essential to good results.

"I have practised green manuring for the past eight years, and would like to say that some soils respond to the treatment (and to fertiliser) much better than others. I remember some years ago green manuring some heavy black clay soil—velvet beans ploughed in—which the following year gave less than the control plot adjoining by two bags an acre. I find it essential to plough a green manured land twice, the second ploughing as late as one dare leave it, say, just before planting.

"I do not wish to appear boastful, but this season we have just finished shelling 10,000 bags of maize from 600 acres, as near as one can get it.

"W. Sole, Glendale."

"We have practised green manuring with sunflowers and different varieties of beans during the last ten years and have had satisfactory results.

"During November, 1928, we sowed 300 acres of Sunn hemp on land yielding six to seven bags of maize per acre and ploughed in the crop in March, 1929. This area was planted under maize in November, 1929, and yielded fourteen bags of maize per acre this season.

"NEWMARCH & MACLEAN, Salisbury."

"The green manure crop on this farm is now considered to be the most important crop grown during the season. The results obtained over the last three years have been more than encouraging to myself and everyone who has seen these various trials carried out.

"Forty acres of land was put down to Sunn hemp during the 1928-29 season, and in the 1929-30 season this area was planted to maize with 200 lbs. of artificial fertiliser broadcasted. The yield obtained was an increase of six bags per acre over the 1927-28 crop of maize.

"On better land the results, too, were better. This land received the same treatment as the 40 acres of land during 1928-29. The yield obtained was 31 bags per acre, being an increase of nine bags per acre over the 1927-28 crop.

"Once the sacrifice is made of putting down a quarter of one's land to green manure, it will not be regretted. The benefits derived from this system of soil management are—

(1) increased yields per acre, resulting in reduced cost of production per bag;

(2) maintenance of the fertility of the soil;

(3) better ploughing at a reduced cost, giving a better seed bed and thus a better stand;

(4) less weeds, thus reducing cultivation and hand hoeing;

(5) the crop is enabled to stand a drought of three weeks with very little ill effect.

"E. PALMER, Umtali."

"My experience of green manuring extends over some six seasons, and it now forms a definite part of my rotation system. It appears to give an increase of two to five bags per acre, and sometimes considerably more. It greatly improves the texture of the soil and increases its moisture-holding capacity; consequently, succeeding crops are more drought-resisting, and winter ploughing becomes easier and is better done. The preparation and planting of land due for green manuring can be so timed as not to interfere with the planting of main crops, and so a greater acreage can be handled with the same labour and plant, thus disposing of the objection that the farmer cannot afford to devote acreage to non-productive crops. The cost of growing an acre of green manure is little more than one-third that of an acre of maize, and it is frequently possible to work in a catch crop after ploughing it in. Green manuring also checks weeds and insect pests.

"R. R. Sharp, Redbank,
Matabeleland."

"Green manuring has been practised on my farm since 1923 on various portions of my wheat fields. On each occasion and wherever it was tried it gave a considerable increase in yield. To my mind no crop should ever be sown on the sand veld until a green manure crop has been ploughed under.

"One-third sunflowers and two-thirds kaffir beans have given very good results on my light soil.

"W. G. Hammon, Umvuma."

"I have for some years been practising green manuring and have steadily increased the acreage under Sunn hemp, until last season I had over 200 acres under this crop, all but 60 acres of which was ploughed under, this 60 acres being kept for seed. I intend next year putting in nearly 300 acres of Sunn hemp, 250 acres of which will be ploughed under. I am a firm believer in green manuring for the following special reasons:—

1. Kraal manure may be better for the crop, but how few farms have sufficient kraal manure to

give an adequate supply for the large maize lands under cultivation, therefore green manuring becomes absolutely necessary where there is a lack of humus in the soil.

2. The land, after Sunn hemp has been ploughed under, comes down to an excellent tilth; after irrigation it does not crack and allow the moisture to escape, nor does it settle into hard clods or close texture, thus giving the roots of plants every scope for growing vigorously.

3. By using Sunn hemp as a green manure crop, a large quantity of nitrogen is made available to the next crop. This I have proved by the splendid leaf development in the crops following a green manuring and the general vigour of the plants.

4. It is an inexpensive method of renewing the vitality of our worn-out maize lands.

"In November last year I sowed about 50 acres of Sunn hemp, ploughed it under in March and sowed wheat in April, May and until the beginning of June. This wheat is now an even, splendid stand and promises to give an exceptional yield of grain.

"A. R. Morkel, Shamva."

"I have been an advocate of the practice of green manuring ever since I started farming.

"The practice on this farm is to have half the acreage under legumes every year, from 25-50 acres under ground nuts, the remainder under Sunn hemp, velvet beans and dolichos beans. About 25 acres of beans are reaped for hay and a portion kept for seed; the balance is ploughed under.

"As a rule, if a land is to be green manured, one year it is planted to velvet beans or dolichos beans and maize in alternate rows the previous year. Planters are set with seed boxes 30 inches apart, maize in one box, beans in the other, and four planters are attached to a Bland's fore carriage with 20 inches between planters. I get 72 per cent. of the land under maize, and a far

larger yield of bean seed than when planted on the flat. Enough bean seed is felt unreaped to sow the land, which need only be ploughed and harrowed.

"H. BASIL CHRISTIAN, Arcturus."

"I have been farming in Rhodesia for nine years and have always green manured a large acreage every year—no year less than 25 per cent., but mostly 33 1-3 per cent. of my total arable land.

"This season, when prices are so low, I intend increasing my acreage—700 acres maize, 400 acres green manure crops.

"I have used sunflowers broadcast very extensively, as this crop does away with practically all hand weeding for the two following crops of maize, and it is a very cheap one to grow and never fails to produce a good stand for turning in.

"I have had splendid results from Sunn hemp, and intend increasing the acreage this year. Beans are too costly to grow and do not clean the lands, which is an absolute necessity these days when the costs of production must be low.

"I only grow maize two seasons following green manuring in order to keep boys' wages at the lowest possible figure, the maize receiving light dressings of fertiliser each year. My average yield is always about ten bags per acre for the whole farm.

"A. L. MILLAR, Salisbury."

"Sunn hemp here is proving far away the best green manure to use, not only as regards yields of maize following such manuring, but also in respect to ease of planting, no after-cultivation needed, and in ploughing under. The only fly in the ointment is the labour of reaping and threshing the seed.

"A. WOODROW-CROSS, N. Rhodesia."

"I can speak with the greatest confidence of the value of green manuring. I have done this now for the last ten years, and I have always had very good results. My great stand-by has been native or kaffir beans (cowpeas).

"E. G. RAUBENHEIMER, Umvuma."

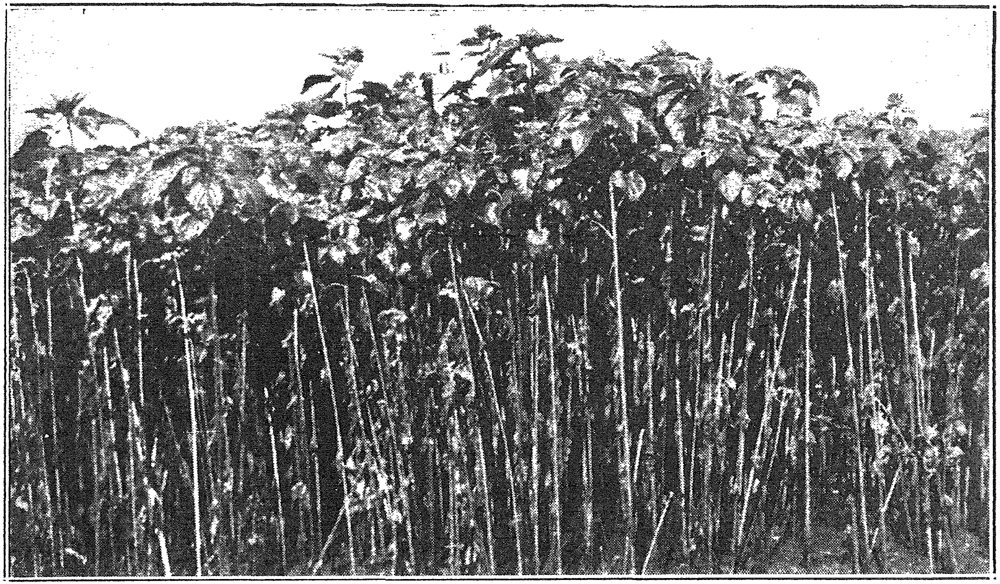


Fig. 8.
Sunflower as it should be grown for green manuring.

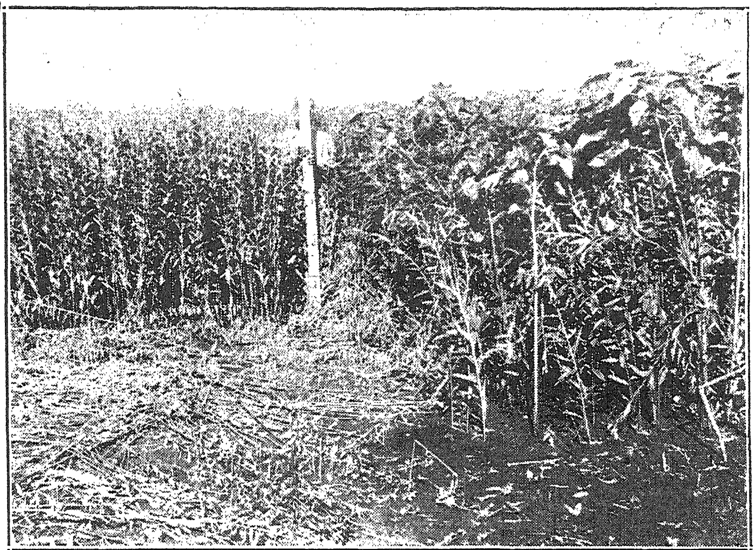


Fig. 9.

On the right a mixture of sunflowers and Sunn hemp for green manure. Both grew quickly, and in other respects combine well for this purpose. Agricultural Experiment Station, Salisbury.

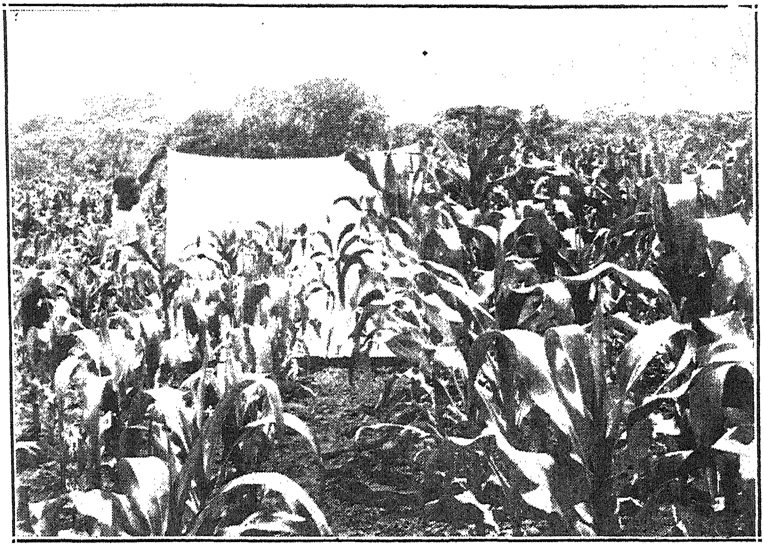


Fig. 10.

Maize on the left following two immature crops of Sunn hemp

Fig. 10.—Maize on the left following two immature crops of Sunn hemp ploughed under. Maize on the right following one mature crop ploughed in. Agricultural Experiment Station, Salisbury.

"Green manuring in some form or other is essential to the profitable growing of most crops on an extensive scale over a number of years in Rhodesia. First experiences may appear to be to the contrary, but trials with the leguminous crops most suitable to the locality, and treated in the way advocated by the Department of Agriculture, will assuredly reduce production costs over a period of years.

"The practice should be substantially encouraged, and should be insisted on in the terms of land settlement on Government ground where maize is to be grown.

"G. D. Brunette, Fort Victoria."

"My experience of green manuring extends intermittently over a lifetime. I learnt about it first when I was at school, and I must admit that even to-day I know very little about the subject. For instance, I have only invested in a tractor this year for the special purpose of ploughing under green manure crops properly, as I consider a lot of efficiency in the past has been lost by my imagining the bulk of the stuff was well under the ground when it was really only just covered. Whether my theory is correct or not I hope will be proved this coming season.

"J. Rademeyer, Fort Victoria."

"It is now four years since I started to green manure, and I am now green manuring about 200 acres every year, mostly with Sunn hemp. If I run out of that seed I use sunflower.

"After the green crop has been ploughed in, I work the ground over to try and keep as much moisture in as possible. During the dry season I fertilise with raw rock phosphate and then cross-plough the land. My average yield on the whole farm has gone up steadily—10, 11, 12 and just under 13 bags per acre this year.

"I have one block of land of 70 acres which gave me 8 bags per acre two years ago; last year I ploughed in Sunn hemp (7 ft. high) and gave the field about 200 lbs. of raw rock phosphate. This season I reaped just over 20 bags to the acre from it (light Glendale soil).

"A. Davis, Glendale."

Relative Value of Different Green Manure Crops.—Sunn hemp (*Crotalaria juncea*) possesses almost every characteristic of the ideal green manure plant. It is a legume, and the bacteria necessary for the plentiful development of tubercles on its roots appear to be present in all Rhodesian soils. It is very quick growing and hardy and drought-resistant, and is so far free of all serious pests and diseases. It makes so rapid and dense a growth that when sown thickly it effectively smothers out weeds, produces a great bulk of green fodder, is easily ploughed under, and finally, decomposes quickly in the soil. The only drawbacks to this crop are the labour and expense of reaping and threshing the seed and the often uncertain seed yield obtainable, these two factors rendering the price of seed higher than is desirable of the ideal green manure crop.

Work is in progress on the Salisbury Experiment Station with the object of breeding heavier seed-yielding strains of this plant without lessening any of its other valuable attributes, and this aim will no doubt be achieved. But a more economical means of harvesting and threshing the seed than by hand is an urgent necessity.

The popular bean crops of the Colony, namely, dolichos beans, velvet beans and cowpeas or kaffir beans, all of which produce vigorous vegetative growth and a considerable weight of green fodder, are also very suitable as green manures. These crops also, however, have their weaknesses, the chief of which are that they do not smother out weeds, and on the other hand are liable themselves to be smothered unless cultivated once or twice during their early life; and, secondly, that owing to their trailing and intertwined growth they are not very easily ploughed under.

Sunflower has been proved a useful green manure crop, but not being a legume it does not enrich the soil with nitrogen to the same extent as will Sunn hemp or the bean crops mentioned. The cheapness and ease with which sunflower seed can be grown, and the crop's excellent behaviour as a weed smotherer, are perhaps its principal advantages. Niger seed (*Guizotia oleifera*) has also been used very successfully as a green manure, but is considered no better than sunflower. The seed is more difficult to win, and is not easily sown evenly owing to its small size.

A number of experiments have been carried out to ascertain the relative soil improving powers of the crops referred to, and below are given some of the results obtained:—

Yield of Maize in Bags per Acre after Various Green Manure Crops.

First Series.

Season.	Velvet bean.	Dolichos bean.	Sunn hemp.	Niger seed.	Sunflower.
1925-26	18.36	14.60	18.42		
1926-27	12.15	13.00	15.14		
Average	15.26	13.80	16.78		

Second Series.

1926-27	23.08	22.44	21.52	20.88	
1927 28	19.84	19.08	19.20	18.08	
1928-29	13.76	11.80	13.02	12.16	
1929-30	14.54	14.14	14.48	13.20	
Average	17.80	16.87	17.06	16.08	

Third Series.

1926-27	12.34	18.40	14.96		

Fourth Series.

1928-29	17.28	18.20	16.44		15.00
1929-30	13.58	14.38	13.42		12.54
Average	15.43	16.29	14.93		13.77
Average yields of 18 plots over 5 years.	16.10	16.23	16.29		

It will be seen that over the five seasons maize following the three legumes ploughed under has practically given the same average yield, namely, approximately 16 bags per acre. In some years one legume has shown up better than another, but no consistently better return has followed the ploughing under of any one of them. Maize following sunflower ploughed under, however, during the two seasons when this comparison could be made yielded on the average 2½ bags an acre less than maize following legumes ploughed under. The inference is that although the cost of the seed may be greater, it will probably in the long run prove more profitable to use legumes than sunflower for green manuring.

Ploughing in Whole Crop as compared with Ploughing in Stubble.—The question is often asked, is it really profitable to plough under the whole crop, or is it not equally good to reap for seed or fodder and plough under only the stubble? No definite answer can be given to this question. Much depends upon the class of land under cultivation and the extent to which it has become exhausted of organic matter. Like many other treatments for soil enrichment, the results of green manuring are not always uniform, and it does not always give as great an improvement in yield in the season immediately following as was anticipated.

The following table shows the relative yields obtained on the Salisbury Experiment Station over the four years 1926-30 from the two alternative systems on soils which, as may be judged from the yields, had been maintained in a fairly high state of fertility by other means apart from green manuring. Owing to their nature these trials naturally require to be carried out on different land each year, and had the soil been of lower fertility the differences in favour of ploughing in the whole crop would probably have been greater.

Yields of Maize in Bags per Acre.
From Ploughing in Whole Crop *versus* Stubble only.

Season.	Green manure crop.							
	Velvet beans.		Sunn hemp.		Dolichos beans.		Niger oil.	
	Ploughed under.	Reaped.	Ploughed under.	Reaped.	Ploughed under.	Reaped.	Ploughed under.	Reaped
1926-27	23.08	20.52	21.52	20.96	22.44	20.40	20.88	18.56
1927-28	19.84	16.40	19.20	16.88	19.08	16.16	18.08	14.56
1928-29	13.76	11.32	13.02	12.20	11.80	10.64	12.16	10.92
1929-30	14.54	11.74	14.48	14.20	14.14	12.66	13.20	11.96

It will be seen that in each case ploughing under the whole crop has resulted in a heavier yield than ploughing under only the stubble, and that the averages are as follows:—

Increase due to ploughing under the whole crop—

Velvet beans	2.8 bags an acre.
Niger seed	2.1 bags an acre.
Dolichos beans	1.9 bags an acre.
Sunn hemp	0.99 bag an acre.

The smaller increase in the case of Sunn hemp is probably accounted for by the thickness with which this crop stands on the land, plants being not more than 2 to 3 inches apart each way, whereas in the case of the beans each root is probably 30 inches by 12 to 15 inches apart from the next. The stubble of the Sunn hemp may in consequence be expected to provide more organic matter and more nitrogen (from the greater number of roots per square yard) than either of the bean crops.

If the legume could be reaped for hay or could be fed off on the land with advantage and profit to live stock, it would often probably be better policy to utilise it in this manner, but under present conditions in Rhodesia, and with the very large areas in need of organic matter, the ploughing

in of the whole crop, or at least a considerable part of it, is generally to be recommended.

The cleaning effect of Sunn hemp and sunflowers by suppressing weeds must also not be overlooked. Feeding off the crop on the land will not have this effect, and if by ploughing in the whole crop the land can be enriched by several bags an acre and can at the same time be cleaned of weeds so as materially to reduce the subsequent cultivation needed, the advantage of the practice is further enhanced.

Time and Stage to Plough under the Green Manure Crop.—Decomposition of the manure crop takes place most rapidly if it is turned under while still green and succulent, while the soil still contains a fair amount of moisture and while the soil temperature is reasonably high. If these conditions are fulfilled, the green crop (except when it is one of the grass family) should be fairly well decomposed in six to eight weeks. When the soil becomes dry, decomposition takes place more slowly, and it is therefore most necessary that the crop should be ploughed under well before the cessation of the rainy season. The advisability of early sowing of the green manure crop is indicated in order that it may be ploughed under while the land is still moist and a few inches of additional rainfall may still be expected.

The stage of the growth of the crop when ploughed in affects the results which follow, and on the experiment stations it has always been found best to plough under when the crop is in green pod, or, in the case of sunflower and niger oil, when in bud or early flower. At this stage the plants appear to contain a maximum of dry matter without being too dry to allow of rapid decomposition.

An illustration accompanying this article depicts the maize crop following one "mature" crop of Sunn hemp ploughed under as compared with two "immature" crops ploughed in. For purposes of green manuring, Sunn hemp is taken to be "mature" when the first green seed pods are well formed. In these trials the "immature" crops were turned down before coming into flower, and, as will be seen, the maize following the "mature" crop of Sunn hemp has made very much better growth than that which followed the two "immature" crops.

Reliability of Green Manuring.—The process seems to be less uniformly successful in other countries than in Rhodesia, but it is believed that in this Colony, when it fails in its immediate object, an analysis of the conditions will generally reveal the reason. It is general experience that a second ploughing, several months after the green crop is turned under, is essential in order thoroughly to incorporate the decaying vegetable matter with the soil. With the same object, thorough cultivation of the subsequent crop is desirable.

If the green crop has been left to stand too late and is dry when ploughed under, or if the land has become too dry, decomposition will take place slowly, and the full benefit from the green manuring may be lost. Similarly, if the green crop is still unrotted, or a large part of it is inadequately covered, and if during the early part of the following season the weather is dry, the subsequent crop may suffer a set-back by the unrotted vegetation absorbing moisture from the land and by keeping the soil so open that losses from evaporation are increased.

The efficiency with which the green manuring is carried out will therefore materially affect the results which follow.

Green Manuring in Areas of Low Rainfall.—It is often broadly stated that green manuring should not be practised in areas which experience a rainfall of much less than 20 inches. To whatever extent this may be true of other countries, it does not seem to apply in Rhodesia. Major R. R. Sharp, of Redbank, near Bulawayo, is farming in a comparatively dry area, and his total annual rainfall on several occasions has been less than 20 inches. Conditions in this Colony are perhaps peculiar. The green manure crop usually occupies the land for the whole of one rainy season, and, if ploughed down at the right time, has the full subsequent six months to become decomposed and incorporated with the soil. Under such conditions green manuring in areas of light rainfall seems to be just as effective and no more dangerous than it is in humid areas with rainfalls of 30 inches and more.

Fertilising the Green Manure Crop.—Several of those whose views on green manuring have been given earlier in

this article refer to the application of fertilisers to the green crop. It is seldom that this is actually necessary, particularly in the case of Sunn hemp and sunflowers, which under local conditions make a good growth even on soils too exhausted to grow major crops. Of late years, however, the use of raw rock phosphate, a comparatively cheap but slowly available phosphatic fertiliser, has become locally popular. The application of rock prosphate to the green manure crop undoubtedly increases the bulk of green stuff to be ploughed under, in some cases to such an extent as to render the turning of it down rather difficult.

The principal advantage of the use of rock phosphate on the green manure seems to be the fact that during the twelve months or so which elapse between the sowing of this crop and the planting of the subsequent crop, a large part of the plant food contained in the fertiliser is made readily available for the following maize crop, which would not usually be the case had the rock phosphate been applied only a short time before planting the maize. It may also be assumed that the large amount of organic matter placed in the soil by the green manuring assists in rapidly liberating the plant food in this fertiliser.

While it remains an appreciably cheaper fertiliser than superphosphate, the application of raw rock in this manner can be recommended, but it must be remembered that in following such a course the farmer is receiving no direct return for his outlay on fertiliser for nearly two years subsequent to its purchase—that is, until the crop following the green manuring has been harvested and marketed. The writer believes that often it may be better policy and nearly as effective to apply the rock phosphate when ploughing the land for the second time after the green manuring, if this can be done fairly early in winter, *e.g.*, June or July.

The Application of Fertilisers in Conjunction with Green Manuring.—Whatever may be said of the advantages or otherwise of applying fertiliser to the green manure crop, it is certain that green manuring will not give its most economical return unless it is accompanied by the application of a phosphatic fertiliser, and possibly by a certain amount of potash also. If the green manure crop has not

itself received fertiliser, the maize crop which follows should certainly do so, and to obtain the best results it would appear that land which is green manured once every four years should during that period also receive at least 400 lbs. per acre of phosphatic fertiliser, applied in 200-lb. per acre dressings, in two years out of the four. The crop which immediately follows the green manuring should always be given the benefit of fertiliser either by direct or indirect application.

Inoculating the Green Manure Crop.—No inoculation of the green manure crops here mentioned seems necessary. Sunn hemp produces root-nodules in abundance on all Rhodesian soils. So also do kaffir beans or cowpeas, while velvet beans and dolichos beans do so on most land. Occasionally they fail to do so very abundantly the first year they are grown on a farm, but where this is the case they almost invariably will do the next year or when grown on the same land for two years in succession. Inoculation of new land can readily be effected for these crops by obtaining a few sacks of soil from a neighbouring farm on which they have been grown for some years and are known to produce nodules.

SPINELESS CACTUS.

It is notified for general information that a limited supply of spineless cactus blades are available for distribution this season from the Salisbury Experiment Station. It is not anticipated that more than 10-12 blades can be supplied to each applicant.

Applications should be made to the Chief Agriculturist, Department of Agriculture, Salisbury.

A Warning to Growers of Fire-cured Tobacco.

By H. F. Ellis, M.Sc., B.Sc. (Agr.), Acting Chief Tobacco Expert.

Owing to the increased amount of interest at present being manifested in the growing of fire-cured tobacco, it appears to the writer that a note of warning should be sounded and emphasis laid on certain facts in order to prevent a debacle similar to that which occurred with flue-cured tobacco.

Particular emphasis must be laid on the fact that the market for Southern Rhodesian fire-cured tobacco has been built up on the basis of wrapper quality leaf. At present the production of fire-cured wrapper amounts to roughly half a million pounds in Rhodesia, while in Nyasaland the production of this type is probably at least three million pounds per annum; the balance of the crop, roughly 5,000,000 pounds, is composed of fillers. It should be emphasised that this crop is sold on an established market, and that the native producers are willing to accept a very much lower price for their tobacco than would be economical in this Colony. With this competition, it is practically impossible to sell the filler type which might be produced in this Colony.

With the increasing acreage grown in suitable fire-cured areas there will be a large increase in the production of filler tobacco, some of which may be sold, provided the wrapper percentage of the crop is high. It is, however, improbable in the extreme that crops grown in unsuitable areas and composed largely of filler tobacco will find any market whatsoever. This condition will apply equally to those who during last season produced a crop consisting largely of filler tobacco which sold then at fairly reasonable prices. The

question then arises, what constitutes suitable conditions for the production of fire-cured wrapper leaf? Apart from the experience of the individual grower, which is to a certain extent an unknown factor, emphasis should be placed on three points, viz.:—

(1) The climate.

(2) The soil.

(3) Curing facilities.

It would be as well to consider each of these points in some detail.

The Climate.—To produce a large percentage of wrapper leaves it is essential that the crop should grow evenly and not spasmodically. These conditions are best met in the lower lying portions of the Colony, where there is during the growing season a minimum of difference between night and day temperatures, and the air is humid and hot. Under these conditions the leaf grows uniformly, and the gum and oil so necessary for wrapper leaf are produced plentifully. Speaking generally, it would be unwise to grow fire-cured tobacco at elevations much over 4,000 feet. In no case probably would it be advisable to grow this type at altitudes higher than 4,500 feet, unless other conditions such as exceptional suitability of soil and high humidity are present.

The Soil.—It must be emphasised that the soil should be heavy and rich, and one that contains little sand and a high percentage of silt and clay. The ideal soil is a rich red or chocolate clay loam containing hardly any sand, but is friable and not too "sticky." There appears to be a decided tendency in certain sand veld areas to adopt the "contact" soil for growing fire-cured tobacco. In the writer's opinion this soil is too light and sandy for the production of good fire-cured wrapper, though it would produce good bodied filler leaf. The "contact" type of soil in these areas is generally looked on as being possibly better than it is, due to the contrast with the poor sand veld around it. Best results are to be expected from a soil which would give when unfertilised a yield of twelve or more bags of maize per acre; below that limit it is doubtful if the desired quality of tobacco can be produced.

Closely allied with soil conditions is the question of fertiliser applications, and here too it may be stated that, despite the richness of the soil, it is well not to stint the application of fertiliser if quality is desired. A dressing of 300 to 400 lbs. per acre of a complete fertiliser mixture is not too much to give the fields to produce a quality crop, and with certain of the lighter loams the amount might well be increased.

Curing Facilities.—The best results so far as quality is concerned can only be expected when the barns are properly constructed and air tight and provided with the proper facilities for ventilation. The writer has frequently noticed that a good crop of wrapper tobacco in the field has been ruined by attempting to cure it without proper facilities, such as in a pole and dagga shed. This observation has been confirmed by a well-known grower in the Shamva area, who stated that the only tobacco of any good that he obtained by this method of curing was that from the centre of the barn, that on the outside being largely rubbish. Unless, therefore, suitable facilities for curing in the form of properly constructed barns are available, it is not considered advisable to grow fire-cured tobacco, except as a small experimental acreage to try out the crop.

Another frequent source of spoiling a good wrapper crop in the field is by hanging the sticks of leaf too closely in the barns, when pole burn sets in and small black spots appear over the surface of the leaf. These ruin the appearance of the leaf, and, what is worse, the wrapper quality is destroyed, as the tobacco then loses its stretch and tears easily.

In any area the acreage under crop should be strictly limited until it has definitely been proved that conditions are suitable for the production of the wrapper leaf type. To gamble on growing any large acreage on an area where the crop has not been proved is unwise in the extreme.

The Preparation of Bordeaux Mixture and Seasonal Notes on Tobacco Diseases.

By J. C. F. Hopkins, B.Sc. (Lond.), A.I.C.T.A.,
Government Plant Pathologist.

Tobacco seed beds are now occupying the attention of a large section of the farming community, so that it appears advisable to jot down a few notes in relation to precautionary measures against plant diseases which, if not carried out thoroughly, may involve heavy loss to the grower later in the season.

It is presumed that by now all tobacco growers are convinced of the necessity for treating seed before sowing in order to prevent infection by wildfire or angular spot, but there does not appear to be such widespread belief in the use of Bordeaux Mixture for the prevention of other leaf-spotting diseases. It is known that at least three fungus diseases of the leaf, of which frog eye is one, may arise in the seed beds, and it has been demonstrated that the regular use of Bordeaux Mixture will protect the plants against infection in the early stages of growth, and will, therefore, to a large extent reduce the possibility of more serious infection in the lands later in the season. Although disinfection of seed will destroy any bacteria of angular spot or wildfire which may be adhering to the seed coat, yet this simple process will not guarantee immunity from these diseases, inasmuch as growing seedlings may become infected from outside sources (1), so that it is considered necessary to spray seed beds regularly with some kind of fungicide in order to afford protection to the young plants. Bordeaux Mixture of strength 4—4—50 has been found to be eminently satisfactory, and does not burn the tender foliage if applied at the correct time. There

are a number of proprietary Bordeaux Mixtures on the market which can be obtained in convenient form, but a considerable saving in expense can be effected by making the spray on the farm. With this object in view, a full description will be given of the mode of preparation of home-made Bordeaux suitable for use on tobacco seed beds.

Contrary to common belief, good quality Bordeaux Mixture can be made with local lime, provided that the best white stone lime be obtained and carefully slaked; it has given good results in the field. Furthermore, it is known that mixtures of the dry powders (bluestone and lime) tend to deteriorate in storage in hot climates, and in practice there is no doubt that sprays made from bluestone and freshly slaked lime give the best results; in fact, the efficiency of Bordeaux Mixture depends to a large extent on the method employed in its preparation. If the following instructions are followed faithfully, no difficulty should be experienced in making an efficient spray suitable for tobacco seed beds at a cost of approximately 3s. 4d. per 50 gallons.

The equipment required by the farmer who intends to plant from 20 to 100 acres of tobacco is as follows:—

(1) Two barrels each of at least 50 gallons capacity (cost 10s. each), one of which may be cut in half and used as a water tub.

(2) A piece of sacking and a long stick.

(3) A raised platform, the height of the larger barrel.

(4) A piece of mosquito gauze, which, doubled, will act as a sieve for straining the spray.

(5) A knapsack spray pump or a spray cart which will span the seed beds.

It is a frequent practice to use a bucket pump and petrol tin in place of a recognised form of spray equipment, but the bother and trouble of operating the bucket pump are not worth the small extra expense of a knapsack pump. Whichever kind of outfit is used, it is advisable to employ a brass lance about 2 feet long between the rubber hose and the nozzle to ensure a spray of high pressure reaching the foliage. Nozzles of the Vermorel pattern should be employed.

To prepare Bordeaux mixture, the unslaked lumps should be separated from the mixture of slaked and unslaked lime

in the bag, and about 5 lbs. of the lumps should be treated with water, so that the slaking goes on at a brisk rate without boiling. The action should not be too slow nor too fast, otherwise an undesirable type of product is obtained which does not make good Bordeaux. The operation is not difficult and is soon accomplished. If the slaking is done over-night and the lime covered with a cloth to exclude the air, it will be possible to prepare the spray at any time next morning that it is required.

To do this, pour 25 gallons of water into each of the tubs, the smaller one being placed on the raised platform, and into it suspend from a stick, placed across the barrel, 4 lbs. of bluestone in a piece of sacking so that the crystals are just submerged. To the larger barrel add 6 lbs. of slaked lime and stir well. Cover the top of the barrel with a cloth or a piece of wood and allow to stand for one hour, stirring occasionally. Now, slowly pour the bluestone solution into the lime water, stirring all the time, and the Bordeaux Mixture is then complete. In order to avoid choking of nozzles, the mixture must be strained before being poured into the spray pump, and for this purpose a doubled piece of mosquito gauze will serve.

It is usual to add to the above mixture a certain amount of "spreader," which causes the liquid to run evenly over the plant foliage and also to adhere more closely. These "spreaders" can be obtained already made up at any agricultural store, and cost about 1s. 6d. per lb. in small lots, larger quantities being cheaper; about 6 ozs. to 50 gallons of spray is used locally and gives good results. The powder must first of all be mixed with a small quantity of water to a thin, creamy consistency and then added to the liquid in the barrel, otherwise it floats on the surface and cannot be incorporated with the spray.

There is a possibility of scorching the young plants if the Bordeaux is not made correctly, so that it is advisable to follow the above instructions carefully. Also, if there is an excess of copper in the spray, a similar result will obtain. If the quality of the lime is not known for certain, it is as well to test for copper by immersing the clean blade of a penknife in the liquid for a short time and then examining for a deposit of metallic copper, which, if present, indicates an

excess of bluestone in the solution, which must be removed by the addition of lime water.

To those farmers who have not prepared Bordeaux Mixture at home, the above instructions may appear complicated and difficult to perform, but after one trial it will be found that the money saved will be well worth the slight trouble involved.

There are various formulæ which are advocated by different writers for making Bordeaux Mixture, one of which states that the lime water and bluestone solution should be made up separately and poured simultaneously into a third barrel. Both this method and the one already described have been tested locally and no difference was noticeable between the two sprays, so that if any farmer has a predilection for the latter method of preparation, there is no reason for his not using it. There is one golden rule, however, that must not be overlooked:—BORDEAUX MIXTURE MUST BE MADE IMMEDIATELY BEFORE USE. If too much spray is made up at one time it must not be kept until the following day, so that the farmer should calculate the amount required for his seed beds before commencing the preparation. As a guide in making the spray, it may be assumed that 50 gallons will be sufficient to cover 250 square yards of well grown plants.

The beds should be sprayed approximately once a week, but no hard and fast rule can be laid down, since heavy watering or rain immediately after spraying may wash the fungicide from the leaves and so necessitate another early application. Since the object of spraying is to give a protective covering to the foliage, it is obvious that if this is removed, then the plants are immediately subjected to infection from air-borne fungus spores or bacteria. Spraying should be repeated at sufficiently frequent intervals to ensure the retention of a blue coating over the leaf surface.

It is thought probable that certain insects which infest tobacco seed beds may be carriers of disease, so that as an added precaution it is often recommended that arsenate of lead be added to the Bordeaux at the rate of 4 ozs. to 50 gallons. It must be remembered that if arsenate of lead is mixed with "spreader," chemical decomposition takes place, in which arsenic is liberated and is likely to burn the tender

foliage of the plants. There is, therefore, an additional reason why this type of spray must be used at once.

Diseases to Look for in Seed Beds.—*Wildfire* and *Angular Spot* are well known to most growers, and their symptoms have been described fully in articles in this Journal (1) and (2). Should either appear, it is of utmost importance that immediate action be taken. All diseased plants must be removed at once and destroyed and the beds sprayed with Bordeaux. In the case of the latter disease, it is advisable to scrap the beds entirely, and obtain plants from elsewhere if this is at all possible, but if such an arrangement cannot be arrived at, then severely diseased beds should be burnt off where they stand or the plants dug out and buried deeply. The loss from wildfire may be negligible or the entire crop may be destroyed, according to the season, for it has been found by experiment that the usual methods of priming or cutting down plants which are infected in the field are useless as control measures in a season favourable for the development of the disease. Angular spot is more amenable to control measures in the lands, but considerable loss is almost sure to be experienced if it is allowed to take a hold upon the crop. Precautionary measures are therefore essential, and no effort should be spared to see that seed is properly treated, all scrap tobacco from previous seasons is rigorously excluded from the seed bed site and that beds are sprayed regularly from the time that the plants have leaves as large as a shilling piece.

Frog Eye is a disease which appears to be becoming more common throughout the Colony, and it has been found to occur on plants which are suffering from nitrogen deficiency in the beds. Careful attention therefore needs to be given to the even burning of the soil and to the regular distribution of fertiliser in order to raise seedlings of a good colour and strong growth. Spraying with Bordeaux will also assist in keeping this disease in check.

"*Damping-Off*" is likely to take place where too humid conditions exist, so that care needs to be given to watering. The disease can usually be obviated by the preliminary burning of beds, but should it occur in patches here and there, spraying with Bordeaux has been found to give good control. Sometimes, however, the disease may appear to be spreading

throughout the beds, and it is then necessary to cut down watering to a minimum and raise the cheese-cloth covers in order to get rid of excess humidity as rapidly as possible. In extreme cases, which are very rare, it may be necessary to drench the diseased areas with formalin solution (one part of commercial formalin to twenty-five parts of water).

Mosaic needs to be guarded against from the moment the beds are sown. Infection is known to be carried to the beds by such mediums as insects and old tobacco trash, in particular boys' snuff and smoking tobacco. For this reason tins of disinfectant solution should be provided in which the labourers must wash their hands before commencing work, and, as far as possible, the native should be prohibited from smoking or from using snuff whilst in the vicinity of the seed beds. If mosaic plants are observed (and they should be sought for assiduously) they should be immediately removed and destroyed, and not, as is frequently done, placed in a heap on the edge of the seed bed site. It must be borne in mind that mosaic is highly infectious, and that a native after handling an infected plant is liable to transfer the disease to a number of others during his operations of weeding, etc.

The occurrence of *Pink Mould* is often viewed with alarm by the grower, but it is known that this fungus is not parasitic and is therefore incapable of attacking the tobacco plants. Its presence is, however, an indication of too heavy watering and it is frequently a harbinger of "damping-off." The beds should be aerated and watering cut down, but care should be exercised to see that the beds are not allowed to become dry, otherwise the very young seedlings may be entirely killed off in a few hours. Such a condition is not infrequently encountered at this time of the year.

The facts must again be reiterated that, from the point of view of disease control, the seed bed is the most important phase of tobacco culture, and that **prevention is better than cure.**

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(1) Hopkins, J. C. F., "The Care of Tobacco Seed Beds," *Rhodesia Agricultural Journal*, September, 1927, Bulletin No. 653.

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Marketing of the 1930 Cotton Crop.

By T. G. Hesse, Manager, Central Co-Operative Cotton Exchange, Ltd.

The 1930 crop will be remembered chiefly for the extremely difficult marketing conditions encountered. Taking it all round, the crop was a success, as the average yields per acre were far in advance of anything previously achieved in Southern Rhodesia. Particular interest attaches to this aspect, as it was a grand scale trial of the new U. 4 varieties provided by the Empire Cotton Growing Corporation. Though comparisons are rendered difficult, yet it is no exaggeration to say that if jassid resistant cottons had not been available, little or no cotton would have been planted, and yields would have been an extremely doubtful quantity. In the matter of quality, too, an improvement has been effected, particularly regarding uniformity of staple—a most important factor.

Prices, however, have provided the disappointment for the season—indeed, one might say that they have been disastrous. The world has been caught in the maelstrom of an economic cataclysm, aided and abetted by far-reaching political upheavals in the East, and quite evidently leading, in all parts of the world, to further economic and political reactions, the trend and portent of which are still obscure. The immediate cause of the debacle was the break of a prolonged period of advancing prices on the New York Stock Exchange and a slump of extreme severity. Markets the world over were affected, and the demoralisation spread to the commodity markets. Cotton suffered with the rest, and has been marked down to well below pre-war prices.

At the time of planting the crop—that is, October-November, 1929—prices stood at around 9½d., and in the months following showed a declining tendency, cotton sharing in the gradual marking down of commodity prices. Conditions confronting the textile trade went from bad to worse, and

as it became apparent that America was not reducing cotton acreage, prices continued to sag. The South African selling season opened in Durban in April with a price level slightly above 8d., which level was drastically marked down to 7d. at the beginning of June on account of continued depressed conditions in the textile trade, coupled with favourable prospects of the new American crop. In the beginning of August these factors caused a further sudden revision to the 6d. level, which in part must also be considered an adjustment to the universal drop in the average level of commodity prices.

The Rhodesian selling season, being slightly later than that of the south, commenced in July, and has suffered under the decline of prices.

The drop in the level of futures quotations, however, does not tell the whole story, for "basis" has also dropped very noticeably. Before going into this aspect it will be well briefly to touch on the mechanism of cotton marketing. The world's market price of cotton finds expression on the principal cotton futures markets for American cotton, situate at Liverpool, New York, New Orleans and Chicago, with the market at Bremen and Le Havre filling a rather secondary role. The world's trade is concentrated in these markets, and directly and indirectly every sale or purchase of cotton the world over causes a reflex on these nerve centres of the cotton trade. In other words, futures quotations portray accurately the world's opinion of the value of cotton. The futures contract for American cotton is based on cotton grading "middling, fair staple," but any other grade and/or staple may be delivered, provided it be not below "low middling" in value. But there are a very great number of differing qualities into which cotton is graded, and the trade values each grade in relation to the value of the futures contract. If a parcel of cotton sells at a higher price than futures, it is said to be at a "premium," or differently expressed, to sell at so many points "on." If the price is below futures, then the parcel sells at a "discount," or put differently, at so many points "off." If the parcel sells at the same price as futures, then it is said to be "pass price," the term "even" also being in use.

There are a number of factors which enter to make up the "basis." In the first place, there is the premium at which

middling cotton is quoted over futures quotations for the current month. This, at first hand, seems anomalous, seeing that the futures quotation is based on middling. However, the buyer of futures takes the risk of having any other cotton delivered him, even to cotton low middling in grade. Although he is compensated by an allowance being made, the buyer who must have middling cotton will rather buy an even-running lot on the spot and pay a premium for it. At the present time (October) middling cotton is quoted at a premium of 10 points "on" October futures quotations in Liverpool, the basis having quite recently dropped from 30 "on." This may be considered as the fundamental factor of basis. This premium of 10 points, however, is only obtainable for middling on the spot in Liverpool ready for immediate delivery—hence we have to calculate into the basis the cost of delivery, say, from an African port or from the interior of Africa. The merchant buying the cotton will also calculate into the basis at which he buys the cost to him of doing business as well as his profit. These factors all go to make up the basis, and those so far enumerated are easily computed; but there are other factors more difficult of computation and explanation. The basis is by no means a constant quantity—supply and demand, trade conditions, and so forth, subject basis to constant fluctuation. A good grade crop with ample supplies of middling cotton will tend to lower the premium, sometimes to vanishing point; conversely, scarcity of middling cotton will increase the premium.

Cotton higher in grade than middling goes, of course, at a higher premium, because it is cleaner, and hence the waste taken out of the cotton before spinning proper can take place is lower. This, of course, also explains why lower grades containing much more waste go at a relatively low price—that is, are valued at a discount. The same applies to cotton either wasty or irregular or soft in staple, which will waste more than a hard staple. For this reason American cotton from the Mississippi valleys and Texas sells at a higher basis than Gulf cotton, and this again higher than cotton from the Atlantic States. Similarly, Rhodesian cotton, being softer than, say, Zululand or Barberton cotton, will often sell at a lower basis.

When trade is brisk the spinner can afford to pay a good basis, but when trade is poor and depressed the spinner is apt to watch the basis he is asked to pay very closely, and will endeavour to lower it further and further.

While we have so far mainly discussed the basis for different grades, the same remarks apply to different staples. Long staple cotton, such as good, strong 1 3-16 ins. and 1¼ ins., goes to the making of certain fine counts of yarn and certain classes of goods. In periods of prosperity these high-priced articles have a ready sale, and fine spinners can afford, and do pay, exceedingly high premiums for special staples. In days of depression, and when hard times restrict sale of the expensive article, demand for special staples is apt to drop very drastically, and an over-supply is soon apparent. Then premiums may all but vanish. Thus, to quote an example: Along the Orange River a very nice stapled cotton is grown under irrigation, and some years ago such cotton sold at a basis of 400 points on, delivered Durban; to-day we have to be grateful to find a buyer at about 60 on!

Were it not for these variations in supply and demand, in trade conditions, and so forth, it might be possible to lay down the scale of differences in grade values on a percentage basis. Indeed, this factor does enter in fixing the relative value of cotton. If we assume that a certain grade of cotton has a waste percentage at the mill of 10 per cent. less than middling, then this cotton should be worth about 10 per cent. more than middling. With middling at, say, 12d., this 10 per cent. would equal a basis of 120 points on middling. But with values as they are to-day at 6d., this 10 per cent. difference would have narrowed down to a basis of 60 on middling only.

In marketing cotton we have then to contend with not only a constantly fluctuating market as given by the futures quotations, but also with a constantly fluctuating basis. Generally speaking, basis is inclined to improve between February and August—namely, as American cotton goes into consumption and supplies dwindle; but basis nearly always drops in September and October owing to ample supplies of new crop American then coming on to the market. This drop is accentuated in the case of our cotton. The reason can be put in this way: that with the American crop coming

to market the trade can buy in 1,000-bale lots, and has little time or inclination to worry about buying parcels of 25 or 50 or 100 bales from South Africa, or from other small producers for that matter. From a basis point of view it is then desirable to get our cotton to market as early as possible. Basis does not only vary from time to time, but may vary at the same time between different markets or between different firms on the same market.

For the last few years the trend has been for a gradual, if slight, reduction of basis. Under the abnormal conditions of this year basis has been reduced very sharply indeed. For one thing, basis must show a reduction in a falling market simply because the equilibrium of relationship between the value of futures and of different qualities must be maintained. With the market at 12d., a premium of 150 on for a certain quality of cotton was equal to a relative premium of roughly 12 per cent. With cotton down to 6d., the relative premium of 12 per cent. would be equal to 75 on for the same quality of cotton.

We do find indeed that cotton graded CREK g. c. (good middling, good colour, 1 3-16 ins. staple) sold in 1926 in Rhodesia at around 150 on, while to-day the same quality of cotton will sell at about 20 on. The drop in the market and extremely bad trade conditions, coupled with very ample supplies of cotton, account for this dwindling of basis. The demand this year has been mainly for "bread and butter" cottons—middling and strict middling, 1 1-16 ins., to good, $1\frac{1}{8}$ ins. Higher grades and longer staples were neglected and fetched little more than the ordinary cottons. Yellow discoloured and low grades, as also cottons of soft staple, were decidedly not wanted, and consequently went at very heavy discounts.

In view of the low basis obtained this year for our cotton, the above explanations are thought to be timely. Even though this year's crop will compare very favourably in points of quality with previous crops, and indeed shows an improvement in uniformity of staple due to the planting of U. 4 cotton, yet it has had to be sold at a much lower basis in view of ruling world market conditions.

That the disposal of cotton under the conditions already depicted was an extremely difficult matter goes without

saying. For the last 12 months spinners the world over have been buying from hand to mouth—that is, they have strictly restricted their purchases to immediate requirements. Under such conditions merchants have, of course, been very cautious in their buying, and this was duly reflected on the Durban market. Right through the season buyers in Durban were reluctant to take low grades, and from August forward Durban buyers virtually stopped all purchases of low stuff at any price. The first parcels of Rhodesian to come to the market sold comparatively readily, but soon buyers drastically reduced their basis, and in some cases stopped all buying. Those sellers having their own connections in oversea markets were able to sell on c.i.f. terms, but others had to either keep their cotton or consign it oversea for sale to best advantage. The consigned cotton will, of course, in Liverpool encounter the fierce competition of large stocks of American and other growths. Unfortunately, a fairly large proportion of the crop turned out low in grade and exceedingly soft in staple. Sale of this inferior cotton will prove most difficult, and prices will be very low.

What of the outlook for the next crop? Thanks to the U. 4 cotton, we have the assurance that average yields per acre will be materially higher than in the past. Therefore, the cost of production per pound of cotton produced must be lower, and in this the most important step has been taken to meet changed economical conditions. As every farmer must realise, his main chance of surviving the abnormal conditions of to-day lies in reducing costs of production. U. 4 is doing this for us. As far as the market is concerned, it is reasonable to expect an improvement by the time the next crop is ready for the market. Prices cannot remain so much below cost of production as they are now, and it is therefore a safe conclusion that economic laws will force an adjustment to at least a price level commensurate with the cost of production.

Making a Garden in Rhodesia.

HINTS FOR BEGINNERS AND NEWCOMERS.

(Continued.)

THE KITCHEN GARDEN.

By Mrs. E. M. V. Carnegie.

Whether we have a regular supply of vegetables or not, it is fun to grow a few for ourselves, and most of us imagine that the radishes, salad, etc., which we ourselves have produced have a better taste than any others. There is generally a patch at the back where a few vegetables, herbs and salads could be grown, and if it is only a very small bit, it is worth cultivating.

To begin with, the ground must be dug deeply and mixed with well-rotted manure, a good layer being put at the bottom of the trench or bed to keep the soil open and moist. If the vegetable grown is varied from season to season in each bed, the soil will remain fertile for years. Where any of the cabbage family has been grown, the soil should be turned over fairly deeply and planted with root crops, carrots, parsnips, onions, etc., and when these are taken up they should be followed by surface crops, i.e., those that do not root very deeply, including all salads, spinach, beans, peas and herbs. This is specially important in a small garden where all the ground is in use all the time, as each different kind of crop prepares the ground for its successor. It does not matter a bit which kind of crop occupies the ground first, so long as they are planted in rotation—root crops, surface crops and deepeners, the last-named so called because they

require the ground to be deeply worked both before planting and when they are taken up.

After each crop, manure should be mixed afresh with the soil, though for the surface crops it needs only to be dug in to about six inches. All garden rubbish, such as stumps of cabbage, old bean and pea vines, etc., should be thrown on a heap and covered with wood-ash and lime and allowed to decay. It is then very valuable for adding to the soil when it is dug over, and which, by this means, is constantly being enriched and improved.

For a small garden patch we should choose salads, herbs, peas, beans, tomatoes, carrots, beetroot and cucumbers, while for a larger expanse we might add mealies, cabbages of all kinds, cauliflower, marrows, pumpkins, artichokes, turnips, parsnips, celery, egg plant, capsicums and perhaps rhubarb. To begin with the small garden.

Lettuces and *Radishes* should be sown continuously throughout the year to ensure a constant supply. They both need light, rich soil, and must never be allowed to get dry, or they will be tough. When about three or four inches high, they should be well thinned out, the lettuces to stand about a foot apart and the radishes three or four inches. Radishes grown too close together are hard and stringy and usually hot; a very common fault.

Mustard and *Cress* may be sown every fortnight, and grow very well between the lettuces that have been transplanted or thinned out.

Cucumbers grow very well on the fence, and if the seed is sown once a month all through the rainy season you can have cucumbers every day. A packet of seeds is more than enough for the year. They may be sown as soon as all danger of frost is over in good rich soil, with a top dressing of manure added as soon as they begin to climb. An open aspect suits them best, and they absolutely must have plenty of water, especially during a dry spell, as the fruit is 95 per cent. water. Constant hoeing or digging round the roots helps to keep them most. There are many varieties, some long and thin, others short and fat; some dark green, others whitish or green with a white stripe—but they all grow equally well. "Cool and Crisp" and "Rollison's Telegraph" are good dark green kinds, and "Improved White Spine" and

"Jewel of Koppitz" good whitish ones, the latter a very prolific sort.

Another good thing on the fence is the *Runner Bean*, especially the scarlet runner, which is as ornamental as useful. It could also be grown as a screen on wire netting stretched between two posts. It must have plenty of sunshine and plenty of room, so should not be sown too closely. Twelve inches apart is not too much in rows three feet away from each other. They may be sown from the beginning of spring, i.e., late August or early September, till the end of the rains.

The dwarf variety or *French Bean* can be grown at the same times. The ground where they are to be planted should be well watered before they are put in, and not again till the leaves are well up, otherwise the bean is liable to rot in the ground. About six inches apart and a foot and a half between the rows is as near as they should be grown, and the soil should be rich and deep. "Canadian Wonder" is the best known kind, and the "Stringless Green Pod," which really is stringless, is another good variety. Some kinds can either be used as green beans when very young or left to produce the seed, which is used in the winter as dried beans. The "Africander" and "White-seeded Stringless" are examples of this kind and are both good. They are better with some support, especially in the rainy season.

Broad Beans like a drier start in life, and should be sown from March to June. When they begin to flower, the tops should be pinched out, otherwise the pods may be slow in forming. These tops are very often covered with green fly, so should be burnt, and the plant sprayed with tobacco water at night and clear water in the morning.

Green Peas should be sown largely in July, August and September and again in January, February and March, though, given a fair supply of water and no frost, a few could be put in every month. The soil in which they are sown must not be too wet, though they will want plenty of water later on. Those planted in August and September and onwards should be kept shaded till well above the ground, as the germ of the pea is very delicate and cannot stand extremes of heat and cold. A good supply of manure water

is very good for them and better than top dressing, as it does not attract the white ant as dry manure does.

"*Matchless Marrow*" is about the best kind, though "Pride of the Market" is also good, and "Black-eyed Marrow Fat" a very hardy variety. The "Sugar Pea" or "Edible Podded" is gathered when young and cooked like a French bean and is uncommonly good.

Tomatoes can be had nearly all the year round with a little judicious management, and what a blessing they are! There is surely no other vegetable or fruit that can be put to so many uses, and, being so full of vitamins, they become almost a necessity.

Starting from September, a little seed can be sown out of doors each month till about April or May. The little plants should be thinned out to stand eighteen inches apart and given some support to keep them out of the dirt. When the plant is well grown, the shoots just above the bunches of flowers should be pinched off, and all the largest lower leaves. More fruit and finer specimens will be obtained if only a few branches are allowed to bear. The unwanted ones should be cut right off about an inch from the stem.

In April and May seed should be sown in boxes and be kept in the warmest and most sheltered spot in the garden. They must be carefully nursed and pricked out into other boxes with plenty of room to grow as soon as they are big enough, and kept in the same warm corner. In very cold windy weather or at the least sign of frost they must be protected by matting or straw and watered very sparingly. Then as soon as cold winds and frosts have gone, they can be planted out into the garden.

"Early Jewel" is a very good sort for planting in this way. "Red Rock" is a later kind that can be sown in the open, and they both produce large, firm fruit that does not crack.

The small kind used for jam grows like a weed and needs practically no attention. It does better if left to sprawl about, and produces clusters of fruit like cherries or small plums for many months on end. "King Humbert" and "Cherry Red" are the two best kinds of this variety.

The largest tomato grown is known as "Ponderosa"; it has huge, bright scarlet fruit, solid and smooth. "Trophy" is a late variety suitable for sowing after Christmas, when it will go on bearing till June or July. "Golden Queen," as its name implies, bears yellow fruit, large, firm and solid. It has a slightly different taste from the red kinds, not being quite so acid.

Carrots may be sown in spring and again in autumn. They should be sown sparingly, as they do not like being transplanted, though they can be thinned out again and again. If the first ones are taken out as soon as the root is formed, the others will swell and grow very quickly, and in a few weeks there will be some ready to cook. From then on you will be able to find a boiling every few days, and by the time the biggest ones are finished, the new carrot bed should be producing the first little ones. The soil for carrots must be well drained (though they need a good supply of water) and as rich as possible to ensure the best results.

When growing *Beetroot* take care that the soil has not been freshly manured, or the roots will be stringy and ugly instead of round and smooth and succulent. It is better to use only decayed vegetable matter in the soil and then to give it a good dose of manure water before the seeds are sown. They cannot stand frost, so should be put in from August to November and again from February to April; a few seeds every week.

The seedlings transplant well before the root begins to swell, and should be about nine inches apart when thinned out.

That is about all there will be room for in a small garden, except a few herbs, and these can be grown as a border.

Parsley, specially the curly kind, can be used as a border anywhere, even in the flower garden, and you can scarcely have too much of it. It can be sown at any time where it is to stay, and thinned out to give each plant plenty of room.

Thyme, *Sage*, *Mint* and *Marjoram* are best sown in boxes and transplanted to their permanent position when about three inches high. When they have become established they can be increased from time to time by dividing their

roots. If you wish to dry and bottle them, cut the sprigs before they flower and hang them in the sun or in a dry corner of the verandah.

Rosemary and *Lavender* do not grow as freely as the other herbs, but can with care be raised to make nice, sturdy little bushes and are always nice to have.

And now for the bigger garden, where we can grow whatever we like without having to consider whether it takes too much room or not.

Practically everyone eats *Green Mealies*, so they must certainly be given a place. The Indian sweet corn and "Maizena," a dwarf variety, are both nicer to eat than the ordinary field mealie and don't take quite so much room. They need to stand at least a foot apart each way, and if they are to be tender and full must have plenty of water and good soil. They can be sown in relays from August to February or March.

Cabbages can be sown all the year round, but the best results are obtained from seed sown in the summer, from November to March, and thinned out to stand two feet apart. They should be kept moist and given a fairly rich soil. The *Savoy Cabbage* likes the cold weather, so should be sown in February or March.

Brussels Sprouts are not very successful. They seem to need much more frost than we ever get here. Grown in Rhodesia they are usually small and loose-leaved, instead of being the solid and tight little balls we expect.

Cauliflower and *Broccoli* need rather more attention than cabbages, but are very well worth it. The ground for both should be deeply trenched and well manured and never allowed to get dry. The seeds should be sown in the summer months—October to February—and transplanted as soon as they have six leaves into rows two feet apart, having eighteen inches at the very least between each plant. They are very greedy feeders, and need manure water every week or two or well rotted manure dug around them occasionally. They should be rushed up and watered very freely in dry weather always in the evening, and the soil kept loose and open. As soon as the flower begins to show the inside leaves should be made to shade it, though they must not be broken right

off. Some varieties do this for themselves, the leaves curling right over as the flower appears.

Pumpkins will grow on any rubbish heap, and must be given plenty of room to roam about. There are ever so many different kinds, but the "Iron Bark" and "Hubbard Squash" are as nice as any and not quite so sprawly as most of the others. Also, they keep very well indeed. The one used by our American friends for pumpkin pie is called the "Early Sugar," and is to be recommended. They should be sown in August and onwards, and, like marrows, must always be plentifully supplied with water till the fruit is fully grown, when less should be given, and in the case of pumpkins, withheld altogether when they are ripening.

Globe Artichokes are easily grown, but take a lot of room, as each plant when thinned out should have three feet of ground each way. Sow them in the open ground in September and October, or as soon as the early rains begin.

Jerusalem Artichokes, like potatoes, will grow almost anywhere, but unless the soil is deep and rich and not too heavy, there will be a bigger crop of leaves than tubers. If grown from seed, they should be sown in a box and transplanted when big enough into a well-trenched bed. It is better, however, to plant the tubers as you would potatoes, covering each one with about three inches of soil. They should be dug up as they are wanted, for if exposed to the air for any length of time, they dry up and shrivel.

Turnips, to be tender and good flavoured, must be grown *quickly.* They like a rich soil and an open aspect, plenty of water and lots of *room.* As soon as the plants can be handled they should be thinned out to stand six inches apart and the soil loosened all round them. In a week or two, if they look at all crowded, thin them out again, for unless they have all the space they want, no roots will form, and your turnip crop will be nothing but leaves. Of course you may like turnip tops—some people do—and if you want them, the surest way to get them is to grow the turnips close together. If they are allowed to get dry or to dawdle in their growing they will be tough and stringy and unpleasantly strong in flavour.

Parsnips are not very satisfactory things to grow, and never seem to be as good as they might be. They do best if sown in the autumn, about March or April, and thinned out into good, rich, deeply-dug soil. They need plenty of water and constant cultivation.

Celery is mostly used for flavouring in this country, as it does not come to perfection without frost, and though you may get a crisp, white heart now and then, it is better not to expect it! It should be sown in December or January, thinned out into beds and transplanted later on into trenches, which should have plenty of good well-rotted manure dug into the soil. As soon as the plants are strong, the earth should be heaped up round them so as to cover all but the leaves, and this process must be repeated again and again until the plant is fully grown. The celery trench should be kept well watered, for the quicker it grows, the more tender will it be, though when everything possible is done, it is still very apt to be disappointing. The flavour, however, is always the same, whether the stalks are green or white, tough or tender.

The *Egg Plant* is a useful addition to the garden and will grow in almost any soil. The seed should be sown in boxes in August and September and the seedlings transplanted when three or four inches high, and stand eighteen inches apart.

The *Capsicum*, Chili or Red Pepper, is becoming more generally known and popular in the last year or two. The fruit can be eaten green as a salad, stuffed and cooked as a vegetable or used just for flavouring.

"Cayenne" has a long, narrow scarlet pod and is very hot when ripe. The "Long Red" is bigger and not so hot, and the "Sweet Mountain" is the best kind for seasoning.

For those who are patient *Rhubarb* can be grown from seed, but it takes three years before the leaf stalks are ready to pull, so most of us would prefer to buy the crowns from a nurseryman and have rhubarb the same year. When once the plants are established, the roots should be divided every year, and when this is done, every piece having a crown will form a new plant. A good dressing of manure should be dug in around each plant and the roots kept well supplied with water. It is almost impossible to give them too much

manure or water. They are very gross feeders, and must be kept constantly supplied with nourishment. Stringy rhubarb is the result of poor soil and insufficient water. Some kinds are practically perpetual, and are only out of action while they are being divided and re-planted. The best of these is the "Crimson Winter" (ever-bearing). If grown from seed, rhubarb should be sown in September, thinned out to stand six inches apart and left till June or July, when it should be again transplanted and given as much room as possible to grow strong and healthy. Then after another year it will be ready to put into its permanent trench, well supplied with manure and freely watered, and in the third year the stalks may be pulled. They should never under any circumstances be cut. When it is grown from crowns, it must be planted in June or July, and if well fed and cultivated, the stalks will be ready for pulling about September.

The most important things in the kitchen garden are:—

1. Thoroughly prepared soil.
2. Rotation of crops.
3. Constant cultivation.
4. A good supply of water.

(To be continued.)

SEED MAIZE.

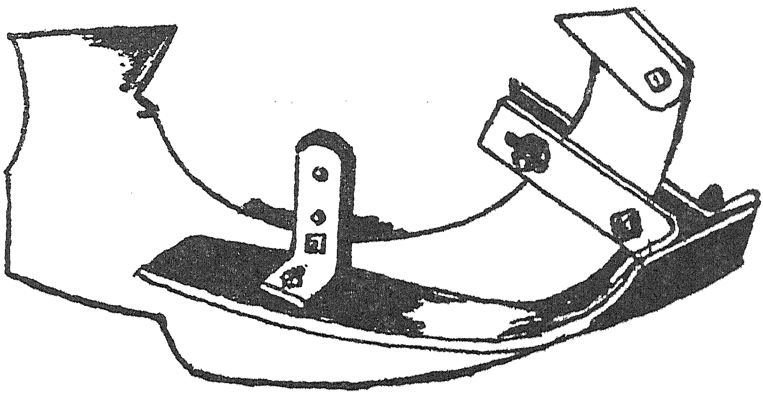
It is notified for general information that all seed maize, whether best seed or tips and butts, supplied this season from the Government Farm, Gwebi, has been treated with Tillantin R. as a preventative against diplodia. The seed, therefore, is poisoned, and should be taken care of accordingly.

Further Notes on Cotton Growing in Southern Rhodesia.

By G. S. Cameron, Cotton Specialist.

In the article which appeared in the October issue of the *Rhodesia Agricultural Journal* no mention was made of the depth at which cotton seed should be planted.

It is generally advisable to plant cotton seed very shallow, so that it is covered by not more than about an inch of soil.



Depth regulating shoe for cotton planter.

When planting by machine it is sometimes difficult to secure an even depth of planting, owing to irregularities on the surface of the soil. In soft ground, or where there are numbers of small hillocks, the planter may go too deep, giving an uneven germination and consequently a bad stand.

This difficulty can be overcome by using depth regulators, which are attached to the runners of the planter. It consists of a steel shoe, which can be easily fixed, as shown in the

accompanying sketch. In addition to preventing the planter from going too deep into the land, the effect of the shoe passing over the soil tends to make a smooth track, in which the cotton seed is dropped.

The use of this attachment is strongly recommended. They are obtainable in Salisbury from various agricultural implement dealers, of whom particulars may be had from the writer.

Fourth World's Poultry Congress.

By H. G. Wheeldon, Chief Poultry Officer.

The World's Fourth Poultry Congress and Exhibition was opened by the Duke of York on 22nd July at the Crystal Palace, London, and terminated with a tour of the British Isles on the 11th August. It was not only the greatest of these international efforts ever staged, but it also provided a unique opportunity for interested people to see the world's best methods of poultry rearing cleverly and compactly displayed for their benefit. It was an exhibition of the world's best birds.

The Duke of York, speaking amid the clucking and crowing of sixty nations, said that in the present depression from which agriculture was suffering all over the world they rejoiced to know that the poultry industry had brought a measure of relief to many a hard-pressed farmer.

The congress and its associated exhibition was organised by the Ministry of Agriculture and Fisheries, in collaboration with the Department of Agriculture for Scotland and the Ministry of Agriculture for Northern Ireland.

This congress is the fourth of a series held triennially under the auspices of the World's Poultry Science Association. The three previous congresses have been held at The

Hague (1921), Barcelona (1924) and Ottawa (1927). The object of these world poultry congresses when first proposed was to bring together those interested in any phase of poultry work, with the purpose of stimulating interest in world poultry affairs, co-ordinating education and international research. That is, to assemble the latest knowledge of poultry husbandry from all countries, to promote united endeavour, international acquaintance and good fellowship among the nations of the world in order to secure the development of a popular and growing industry. These objects have never varied, and the result is the gatherings have an international significance; those who take part co-operate in friendly endeavour, and thus proving the search for new knowledge and fresh fields for business cannot be associated with ill-will, unfair competition or selfish pursuit of advantages. The congress was attended by 400 delegates.

It is difficult to conceive of any other building which could provide a more appropriate setting for a world's poultry congress than the Crystal Palace. It is a giant structure of glass, magnificent in appearance and with a rich collection of permanent art treasures drawn from many countries. It has been the centre for years past of a world-famous annual competitive poultry display.

The congress was divided into three main sections, as follows:—

1. The Sessions.
2. The Exhibition.
3. The Congress Tour of the British Isles.

The sessions embodied 156 papers, which were in nearly all cases read by the writers, who consisted of scientists, investigators and other foremost authorities on the subject of poultry husbandry. They included papers on breeding and incubation, 29; nutrition and rearing, 25; diseases and their control, 32; economics (including marketing), 30; education and general, 31; rabbits, 9.

The delegates of the congress from all participating countries met daily in the conference halls to discuss the numerous scientific and economic problems which hinder the development of the industry they represent. Educational films during periods when delegates were not in conference

were displayed by several countries in the cinema hall at the Crystal Palace.

The exhibition section consisted of three divisions:—

(a) The national exhibits, staged by 25 countries, were prepared not from commercial motives but to illustrate the main characteristics of the poultry industries of the countries concerned, with some reference to other national features. In this category should also be noted the exhibit of the Empire Marketing Board, to which the leading British Dominions and Colonies contributed. By this means the participating countries illustrated the part played by education, research and economics in the development of the poultry industry. These exhibits, which included several foreign countries, were of special interest, and from a scientific point of view, as well as that of the agriculturist, were claimed to be the most wonderful ever staged. A feature of these exhibits which attracted much attention was staged by the United States of America and was labelled the Egg Factory. A sectional model of a hen six feet in height cleverly demonstrated by mechanical means the working and function of the internal organs of the hen, including the manufacture of the egg.

(b) In the commercial and general display sections were many things of interest. The outstanding and most modern features of the trade section were the mechanical processes for grading, candling and stamping eggs, various types of battery brooders and the latest mammoth machines that help the breeder and rearer to work on a scale that would have seemed fantastic a few years ago. The general section contained dioramic models of various poultry institutions, exhibits of houses, appliances and other details of special attraction in connection with the industry, in addition to many displays by foremost poultry breeders. An exhibit of remarkable interest which was staged by Canada, apart from their national exhibit, was a large scale model of the Prince of Wales's ranch, measuring approximately 100 feet by 50 feet, and representing 75 acres of that portion of the ranch at Calgary, in Canada, which includes the homestead. Seventeen buildings were shown on an accurate scale. The streams that intercept the ranch were represented on the

model by running water; and in the background were the majestic peaks of the Canadian Rocky Mountains.

(c) Thirdly, the great international display of live stock. Apart from the avenues of stands, which occupied the main floor and were in themselves an education which no agriculturist could afford to miss, was, on the ground floor, the galleries of the main floor and on the Italian terraces, an exhibition of nearly 5,000 birds. This was a striking exhibit of stock brought from all parts of the world. The live stock exhibits were all staged on a national basis. Among the popular and well known breeds, which have been the backbone of poultry farming throughout the world, were to be seen, side by side, many strange birds from foreign countries, which all claim a common ancestry. The display of utility stock was very complete. Many of the exhibits were birds with remarkably high individual egg laying records. The King and Prince of Wales were both exhibitors.

The tour of the British Isles included visits to research stations, agricultural colleges, egg laying tests and foremost commercial poultry farms in England, Wales, Scotland and Ireland. The 400 delegates on their visit to Scotland were given the opportunity of inspecting the Buttercup Poultry Farm at Clermiston Mains, Corstorphine, Edinburgh, which was described as Britain's largest and most up-to-date poultry farm, and indeed it is claimed to be the largest in the world. It covers an area of nearly 100 acres and has accommodation and equipment for 200,000 laying hens, which are housed in semi-intensive laying sheds of modern design and construction. Special breeding pens are provided for 20,000 breeding stock, and the hatching—which is equipped with nine Mammoth Buckeye incubators, each with a capacity of 16,000 eggs, giving a total hatching capacity of 144,000 eggs, and twelve Pierce Mammoth battery brooders—has a rearing capacity of 300,000 chicks. The whole farm is run on up-to-date scientific lines, the fullest use being made of electricity and numerous labour-saving devices.

The exhibition, congress and inspection tour were indeed experiences never to be forgotten.

Farming in the Marandellas District.

By A. N. and E. C.

In the Marandellas district a larger amount of land than usual was put under oats last season, and there is no doubt that, even if there is only a limited market for them, they provide an excellent feed for stock during the winter months at a small cost. The illustration shows a field of six acres grown in the latter part of the summer at Cotter. The land, which for the most part is a light red sand, was stumped the previous season, and nothing more was done to it till last January, when it was ploughed and prepared for the seed, which was sown at the commencement of the following month. Two bags of Kinvarra oats broadcast were found to be sufficient, and no fertiliser or manure was put on. Early in April, during a dry spell, the oats, which were then only fifteen inches high, showed signs of shooting, but fortunately rains fell, and from then until the time they began to ripen there was no lack of moisture in the ground.

The crop was an excellent one, standing evenly and of the same height all over the field, as may be seen in the illustration. There was no sign of rust and scarcely any smut. Before being fed to the stock, the oats were partly threshed out, by which means over twenty bags of seed were obtained, which alone should bring in a good return for the outlay on the crop.

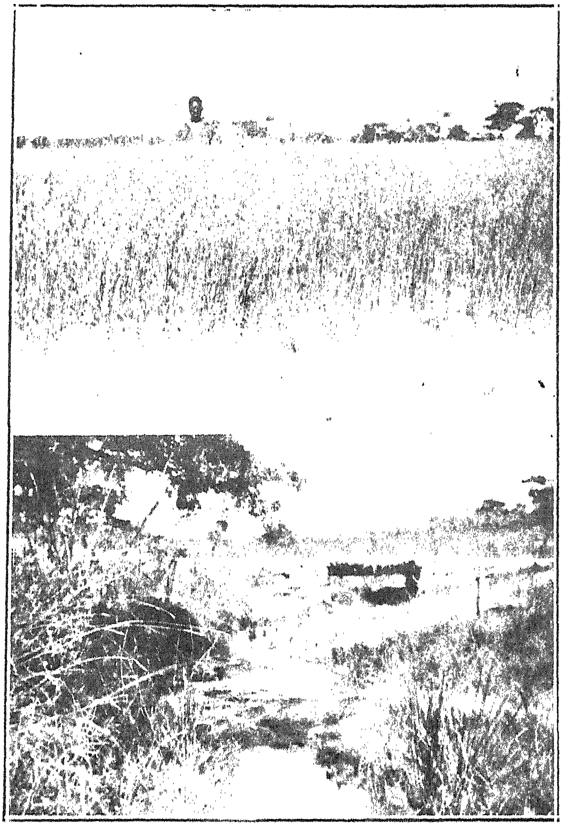
The bridge shown in the second illustration was put up with ordinary farm labour, and more than answers the purpose for which it was designed. There were difficulties in constructing a drift, owing to the lower part of the right hand bank of the spruit being saturated with water, and the spruit also being narrow and the banks steep. On the other hand, the bed of the spruit at this point was of flat rock, extending into the banks on each side and forming an ideal

foundation for a bridge, and there was also plenty of good building stone within easy reach. The abutments of the bridge are faced with heavy stone, roughly squared and bound in with smaller stone, the spaces between being fitted up with broken stone. At the height of about four feet, three heavy gum poles, 30 feet long and 15 inches in diameter, were laid across the 10-ft. opening, one in the centre and the other two at a distance of three feet on either side. Across these again were laid close together poles 11 feet long and 6 inches in diameter, covered with a layer of brushwood and coarse gravel with some good binding soil to form the roadway. Finally, the spaces between the long poles on either side were filled in and the roadway brought up to the level of the centre part. So far, although it has been in constant use and subjected to the strain of heavy ox wagon transport, as well as of some heavy floods when the water rose more than half the height of the opening, there has been no sign of displacement.

Maize Yields in the Rusape Area.

In the following table is shown the history for the past three years of five fields on the farm Nyamasanga, in the Rusape district. The soil of these fields is a medium sandy loam of the so-called "contact" type, which had been under crops for a number of years previously. It is obvious that the fertility of the soil had been allowed to fall to a low level, and the figures of yields show how good treatment with phosphatic fertilisers and kraal manure will help to restore the fertility.

The results obtained on fields 8 and 10 go to show that rotation of crops alone is not sufficient. These fields require green manuring or dressing with kraal manure to restore the supply of humus in the soil.



Above: Six acres of Kinvarra oats at Cotter Farm, Marandellas.
Below: Bridge on Cotter Farm erected by ordinary farm labour.

Cropping and Yield per Acre in Bags.

Field	Acreage	1928		1929		1930	
			Bags.		Bags.		Bags.
No. 1	5.0	Maize plus 200 lbs. B. and S.	6.2	Maize plus kraal manure	12.0	Maize, no treatment †	14.0
No. 6	20.0	Maize plu 200 lbs. B. and S.	5.1	Maize plus 150 lbs. B. and S.	8.0	Maize plus 150 lbs. B. and S.	12.6
No. 7	4.5	Sweet potatoes	Not recorded	Maize plus 180 lbs. B. and S. ‡	4.6	Maize plus 180 lbs. B. and S.	11.1
No. 8	9.0	Sweet potatoes	Not recorded	Maize, no treatment	5.1	Maize plus 180 lbs. B. and S.	4.1
No. 10	10.0	Munga	0.6	Cowpeas	1.5 and hay	Maize, no treatment	6.2 crop damaged by wild pig

† Maize underplanted with sweet potatoes.

‡ Maize underplanted with cowpeas.

The rainfall for the three seasons was as follows: 1927-28, 28.23 inches; 1928-29, 48.58 inches; 1929-30, 35.30 inches.

The yield was found by taking a number of bags (tied) of cobs, shelling carefully and weighing. The average yield of grain per tied bag of cobs was 86 lbs. The number of bags of cobs from each section was carefully counted and recorded.

Resolutions Passed at the Rhodesia Agricultural Union Congress,

HELD ON 23rd, 24th and 25th SEPTEMBER, 1930.

Agricultural Policy.—

In order to maintain a white population in Rhodesia, means must be found to establish on the land a European farming community under reasonably prosperous conditions. The whole policy of the Government should be directed to that end, with special attention to the economic conditions of the industry.

Costs of Production.—

That in view of the drop in world prices, lower costs of production both in farming and mining are essential. United action should therefore be taken by the farming and mining industries in order to attain this object by requesting the Government to reduce its expenditure and by putting pressure on the railways to reduce their rates in order to lower the cost of commodities necessary to the primary producers of this country; and that in view of the fact that the percentage of the Civil Service to the population of Southern Rhodesia is probably one of the highest in the world, and that economy being laid down by all authorities as the only cure for the present economic crisis, this Congress urges on the Government the desirability of immediately and severely reducing the personnel of the Civil Service to the bare absolute requirements.

Economic and Marketing Division.—

That the recently formed branch of Agricultural Economics and Marketing be established on a permanent basis and enlarged.

Market Reports.—

That the Government be requested to publish official reports in regard to local markets, and that where possible such reports should be broadcasted.

Maize Stabilisation.—

That in the interests of the people of this country the Government should take immediate steps to stabilise the price of maize.

It is resolved that this Congress urges the Government to expedite the meeting of the proposed Agricultural Commission and their report, and to fix a definite policy to stabilise the agricultural industry of Rhodesia.

Bounty on Export Maize.—

That this Association, while appreciating to the full the Government's recognition of the inadequacy of the financial return to the producer, as evidenced by the granting of a bounty on export, desires to express its keen regret that such a measure was passed owing to the Government's non-acceptance of the principle of legislative aid to stabilisation and the failure on the part of those in opposition to put forward an alternative scheme.

Plant Breeding.—

That the Government be asked to commence the breeding of maize on the lines indicated by the most recent research.

Shipping Freights.—

That the Conference lines be asked to reduce the freight on agricultural products exported and agricultural requirements imported through Beira, as has been done in the case of Union ports.

Dairy Organisation.—

That Congress asks the Dairy Committee to immediately formulate some scheme of control.

Tobacco.—

That the Government be asked to abolish the excise duty on cut tobacco.

That this Congress supports the principle of effective Empire preference wherever possible.

Tobacco Advances.—

That the Government be asked to authorise the Land Bank to make advances on all grades of tobacco accepted by the Control Board.

Land Titles.—

That Congress deems it essential that a new form of land title giving the purchaser greater security than hitherto be issued. That old titles be revised where necessary and that compensation for disturbance be substantial.

Special Cattle Committee.—

That Congress is of opinion that the Rhodesia Agricultural Union should have a standing Cattle Committee to advise the Executive on all subjects connected with the cattle industry.

Messrs. C. C. Macarthur and D. Black elected, with Mr. McLean alternate.

East Coast Fever.—

That Congress views with grave apprehension the policy introduced by the Government of moving cattle from infected areas for slaughter purposes, and that the principle of the movement of cattle condemned for East Coast Fever is contrary to the spirit of the resolution passed by the Legislative Assembly.

That the Government be asked to give more attention to research work in connection with East Coast Fever.

Sheep.—

That the Government be urged to undertake extensive experiments with sheep.

Native Women.—

That the freedom afforded to native females is becoming a menace to the farming community, and that Government be urged to introduce measures to control their movement.

This was left for the R.A.U. to nominate a committee and go into the matter with the Premier.

Roads.—

That where stations, sidings, etc., are established by the railways, the Government arrange adequate provision for access to these by the inhabitants of the district.

Power Paraffin.—

That the Railway Commission be asked to recommend a reduction in the railway rate on power paraffin from Beira to inland stations.

It is resolved that the Government be pressed to repeal or drastically amend the Railways Bill, pointing out that the present excessive profits made by the Rhodesia Railways and the colossal size to which the reserve fund has grown in three years is most unfair when the wholesale depression of the country is considered.

Coffee Growing.—

That the attention of the Government be drawn to the need for fostering the coffee industry and for research work in connection with the diseases of the coffee plant.

RESOLUTIONS RE-AFFIRMED.

That Congress request the Government to strengthen the laws for the suppression of grass fires.

That the Rhodesia Agricultural Union investigate the system on which farmers are assessed for income tax, with particular reference to the valuation of cattle.

Recognising that cheap motor fuel is one of the main essentials in the future development of Rhodesia, this Association re-affirms its resolution of two years ago with reference to the excessive cost of petrol and paraffin.

That the Government be requested to enter into negotiations with the Portuguese authorities with a view to having suitable receptacles installed at Beira for the receiving of petrol and oil in bulk; and, further, that the railway rates on these commodities be considerably reduced.

That Congress press upon the Government to investigate and proceed immediately with the Sinoia-Kafue railway, as the most important means of increasing markets, settling the land and stimulating production in front of the country to-day.

That the Road Councils Ordinance be further amended as follows:—Section 1, sub-head Rateable Property: The words "Mining locations, native compounds, mine buildings and plant, as far as they are used exclusively for mining," also the words "and railway property," be deleted.

That if the slaughter policy is adopted by the Government for the eradication of East Coast Fever, full compensation should be paid to the owners.

Correspondence.

[No responsibility is accepted by this Journal for the views expressed by correspondents.]

The Editor,
The Rhodesia Agricultural Journal.

Sir,

The Carob Bean Tree.

I was very interested in your editorial remarks on the carob bean tree in the September *Agricultural Journal.* In South America this tree is evidently thought a lot of. E. F. Knight, the author and explorer, in "The Cruise of the Falcon," tells how he crossed the continent from Buenos Aires to Santiago, most of the journey being done with horses. Conditions in parts of the country he traversed were apparently very similar to ours in Rhodesia. The altitudes were high, the rains only fell for a month or two each year and bush fires were constantly burning out what herbage there was. "The grass in this part of the Pampas does not cover the earth," he said, "but grows in scattered tufts with bare, baked earth between." He goes on to tell of the difficulties of feeding his horses on this long journey, and how for weeks on end they subsisted and even grew fat on the beans of the carob tree, or Algaroba as he calls it. He writes:—

"The camps were covered with mimosas and thorny bushes, commonest and most imposing among which rose the Algarobas, noble trees of the mimosa species. The Algaroba is a tree of great importance in South America. In the first place, it is used in place of coal on the railway engines, and its wood serves for sleepers. In the hot provinces of Santiago del Estero it bears fruit every year, but here in more temperate Cordoba but once in four years. This is a large bean-like pod full of saccharine matter. It is excellent food for cattle, and horses, when hard worked, thrive on it as well as on maize. Even human beings extract nourishment from the Algaroba pod. The poor of Santiago almost

entirely subsist on cakes made from it, and the children seem to be perpetually chewing the hard, sweet seed in its raw state. An enterprising Frenchman attempted to prepare sugar from it, but failed to compete with the cane sugar of Tucuman. However, a very palatable spirit is extracted from it. The Algaroba is of the same species as the locust tree of Cyprus and Asia Minor."

Another writer states that it was the pods of this bean that were referred to as "the husks" in the parable of the Prodigal Son.

Knight goes on to describe another tree that might be serviceable in Rhodesia. He says of it:—"There was a huge cactus, too, hereabouts that bore plentiful fruit, somewhat like that of the prickly pear in outward appearance, but larger. Some of these were bursting open with ripeness, and disclosed the delicious pulp within, cool as spring water and of a blood-red colour. This is called the Oukli here; a lovely fruit, and one of the most useful in South America.

"In the rainless, arid districts of the Andes, in Santiago, and other provinces remote from the sea coast, where the rainfall is irregular and rare, and where, after long months of cloudless, burning skies, the pastures wither up, the lagunas dry, and the cattle perish of drought, in rocky regions too, baked by the vertical sun, where no other plant can find sustenance, the blessed Oukli flourishes. Those stout, prickly stems and manifold round fruit, covered with thick, green rind, blushing slightly with the red pulp within, are fleshy and juicy to excess, full of an insipid sap sucked in from the heavy dews of the night. These plants are admirably constructed for the absorption of the floating vapours.

"In the seca—the drought—the rancher will go out and cut down with his machete a quantity of these soft, pulpy cacti, which the cattle will eagerly devour, both stem and fruit, therein finding an abundance of both food and drink. Were it not for the Oukli, many portions of this province now inhabited would have to be left utterly desolate. We found the cool fruit, which can be eaten with impunity, very grateful."

I am, etc.,

R. G. Gossip.

The Editor,
The Rhodesia Agricultural Journal.

Sir,

Honey Badgers.

Judging from my experience with honey badgers, netting pegged down, as advised in the *Agricultural Journal*, is inadequate.

I found they could quite easily climb over 3 ft. netting, so I added 3 ft. more, with the top 18 ins. over-lapping horizontally outward. This they were unable to climb, but they burrowed under it. I then made a trench under the netting about 18 ins. deep and filled it with stone, tying the netting down every 3 ft., but they burrowed in various places until they found a stone sufficiently light for them to shift. They are able to move a stone about double their own weight.

To try to save one hive I placed a very heavy flat stone on the top of it, which the badgers were unable to move, but they dug the soil from under the brick platform on which the hive stood until the lot toppled over. I finally poisoned them with strychnine on honeycomb.

Yours truly,
J. St. K. Doyle.

Notes from the "Gazette."

"*Gazette*" *Date.*	*Items.*
	AFRICAN COAST FEVER.
	Melsetter Native District.
3.10.30.	The farm Hartebeest Nek is released from all restrictions. (G.N. No. 597.)

Farming Calendar.

November.

BEE-KEEPING.

Now that the first honey flow is on, be sure the hives stand level, whether working them for extracted or section honey. This is important, saving annoyance when preparing the product for market. Occasionally, where bees have not been thoroughly subdued, they object to the removal of honey; postpone the operation for 24 hours. Where increase of stocks is required, artificial swarms can now be made. Use care in storing honey.

CITRUS FRUITS.

If no appreciable rain has fallen, irrigation must be resorted to in order to keep the trees in good growth and to prevent any check to fruit development. This is a good month to plant green crops. Sunn hemp is possibly the best crop to smother weed growth and supply humus-forming material after it is ploughed in. If not already done, storm drains should be made on the sloping ground to prevent erosion of the surface soil during heavy storms. Where new plantings are contemplated, the holes should be dug and everything got in readiness for planting if the trees are ready for lifting in the nurseries. All unthrifty trees could with advantage have an additional amount of fertiliser and manure applied during the month. Keep down all water shoots.

CROPS.

Take note when the first rains fall, and see what leaks there are, if any, in the farm buildings. Do not neglect to effect such repairs as are necessary. Early in the month see that the planters are in perfect order, and that they drop the different seeds to be planted evenly and at the right distance. Try them out on the farm road. Hasten the work of getting the lands for early sown crops into as good a condition for seeding as possible, so that the first and most favourable opportunity for planting may be seized. The young plants make more rapid growth in a good seed bed. Utilise exceptionally early rains for this purpose rather than for planting. The holes for check-row planting of maize can continue to be prepared until sufficient rain has fallen to allow of planting. Velvet beans and dolichos beans for seed or hay may be planted dry if the land is in good order. With favourable weather, planting of maize, velvet and dolichos beans and cotton will commence about the middle of the month, and will continue as the condition of the land and the rainfall permit. Main crop potatoes should be planted from now on to January. Dhal may be planted for seed or green manuring—if for seed, a frost free situation is necessary. Kaffir corn for seed may be planted this month. Green-manure crops requiring a long growing season should be planted. Destroy, by feeding or burning, early planted trap crop of maize or volunteer plants which have become infested with stalk-borer.

If weeds are beginning to show, keep the harrows going in front of the planters. If weeds are too advanced to be killed by drag harrows and too numerous to be dealt with by hand labour, use the disc harrow or lightly re-plough the land. If the tilth is good, do not be afraid to harrow the young maize. This will save much labour later on by destroying the weeds while they are small.

DAIRYING.

In a normal year veld grazing should be plentiful in November, and the feeding of dairy stock is then very much simplified; veld grass in a green and succulent condition is practically all that is required for animals of less than average production. Heavy milking cows, however, on early pasture, require extra feed in the form of concentrates, while the latter should always be fed to dairy stock which are in poor condition at this time of the year. Young calves should not be turned out to graze with the herd, and in wet weather are best kept in a clean, dry, airy pen. Weaned stock, which have not hitherto had access to green pasture, should be gradually accustomed to the change in diet and may at first be turned out to graze for short periods. Young stock on pasture should also receive a small daily allowance of concentrates.

Farmers supplying cream to the creamery should adjust the cream screw to the separator so that the latter will separate a cream testing 45 to 50 per cent. butter fat. Cream of this consistency will keep better than thinner cream. It should be borne in mind that it is practically impossible to produce first-grade cream if the cattle are milked in a muddy kraal. In the absence of a cow shed, every endeavour should be made to erect a small milking shed in which four or five cows can be tied, milked and fed. A small shed of this kind is also essential to obtain clean milk for cheese-making. Milking in a muddy kraal invariably results in a gassy, bitter cheese being produced.

The shelves of the cheese room should be scrubbed with boiling water and soda, and for the last rinsing a weak solution of formalin may be used. This should prove effective in controlling cheese pests.

DECIDUOUS FRUITS.

Continue thinning out fruit on the trees if a very heavy setting has occurred. A small amount of large-sized fruit is preferable to a large crop of small fruit. Thin down the inner growth of new shoots if they have a tendency to crowd each other, and stop all suckers and main stem growths as they appear.

ENTOMOLOGICAL.

Maize.—Crops planted before the last week in this month are liable to suffer later from stalk borer. At Salisbury, crops planted after 27th November have escaped serious injury, but early December plantings are probably the safest. Volunteer maize is commonly badly infested and should be cut out and removed immediately, otherwise the borers tend to spread to surrounding plants. If rain has fallen sufficiently early, lands may be baited at the end of the month against surface beetles, snout beetles and other pests which tend to reduce the primary stand of plants. The formula is arsenite of soda 1 lb., cheapest sugar 8 lbs., or molasses 1 gallon, water 10 gallons. Dip chopped Napier fodder or other green stuff and distribute broadcast. The poison may be sprayed over volunteer maize and weeds on land with good effect. Cutworms do not usually appear in numbers until December, except in low-lying land. Succulent green stuff soaked in a 2 per cent. solution of sodium fluoride is the most recent formula for poisoned bait, but destruction of these pests is difficult. Keep the land clear of weeds as a preventive measure. If the young plants are attacked by the black maize beetle (heteronychus), the only remedy is to destroy by hand. Good, clean farming will control these pests to a large extent.

Tobacco.—This crop is subject to many pests in its early stages, although attacked by a few after vigorous growth has started. Keep cheese cloth covers on seed beds at night to exclude pests, and spray regularly with arsenate of lead (powder) 1 lb. in 30 gallons of water to protect against leaf-eating insects, etc. Lands may be baited against surface beetles with maize bran moistened with arsenate of soda 1 lb. in 30 gallons of water. Distribute in balls about the size of a golf

ball and cover over with branches or anything to protect from sun. Place one ball to each ten plants and moisten again when dry.

Potato.—The first brood of leaf-eating ladybirds appear in November. Spray with arsenate of lead (powder) 1 lb. in 30 gallons of water. Spraying is also useful against the black blister beetles, which sometimes attack the crop on sandy soils. Keep the soil of irrigated crops well hilled and in friable condition as a precaution against tuber moth laying eggs on the tubers.

Kitchen Garden.—Plants of the cabbage family are liable to attack by diamond-back moth and other leaf-eating insects. When considered desirable, young plants may be dusted lightly with arsenate of lead (powder). Cabbage aphis may be kept in check by liberal watering and frequent washing with a forceful stream of water from a hose pipe or spray pump. Drenching the plants regularly with cold water is also held to be a good remedy for the diamond-back moth mentioned above.

Deciduous Fruits.—Young trees may need spraying with arsenate of lead (powder) 1 lb. in 20 gallons of water as a protection against chafer beetles, whose attack may check the growth very seriously. Choice varieties of early peaches may be netted to protect them from fruit-piercing moths.

When in doubt as to the identity of any pest or the method of dealing with it, apply promptly to the Chief Entomologist, Salisbury, bringing or sending specimens of the insects concerned. Note, however, that it is sometimes feasible to prevent injury from pests for which no practical remedy is known. Farmers should therefore endeavour to obtain some knowledge of the pests of the crops they are growing through the articles published in this Journal.

FLOWER GARDEN.

All seeds may now be planted. Annuals for January flowering should be sown, amongst which the following will be found to do excellently in this country:—Balsam, Calliopsis, Centurias, Chrysanthemum, Dianthus, Escholtzia, Marigold, Mignonette, Gallardia, Phlox, Poppy, Nasturtium, Nigella, Verbena and Zinnia. These are all hardy, and may be sown in the open either in beds or in the position desired for flowering. Advantage should be taken of each shower of rain during this month to keep the soil well worked and loose.

VEGETABLE GARDEN.

All vegetable seeds may be sown during this month. Tomatoes and early peas and beans should be staked. The soil should be kept loose and free from weeds, which now get troublesome. Sow pumpkin, mealies, peas and potatoes.

FORESTRY.

Sowings of eucalypt (gum) seed should be made for late planting. If fresh seed of cedrela toona is available, sowings should be made. Keep the seed beds moist and free from weeds. The tap roots of early seedlings may be cut back in order to form hardy, stocky plants most suited for planting. Continue with pricking out if transplants are to be used.. Prepare all land to be planted by cross-ploughing and harrowing. A well prepared soil is a good fertiliser; it assists establishment and reduces failures.

POULTRY.

Some birds will now be commencing to moult. This will cause a decrease in the number of eggs laid. The poultry keeper, therefore, should see that his birds come through the moult as quickly as possible. Some birds will lay and moult simultaneously, but these are the strongest, most vigorous and the best layers; the majority do not. The process of moulting is a natural one, but it is a severe strain on the system. Fowls that are not too fat, and can stand extra feed at the commencement of the moult, come

through it best. More green and animal food should be given, and the utmost care taken that they are not exposed to cold or wet, otherwise they will not only take longer to moult, but go off in condition. A little linseed stewed, or linseed meal, or ground nut meal and milk should also be given. There will next month be a demand for table birds, and such as the poultry keeper intends to sell should be selected. In making this selection, it is no use choosing old or scraggy birds, for it is hopeless to attempt to fatten these, or make them good table birds. Do not coop them up till a fortnight or so before they are to be sold; give them free range and feed them well, with at least one feed of soft food mixed with milk once a day. Turkeys destined for the Christmas market should have free range, but also a feed of soft food once a day, and a good feed of mealies in the evening.

STOCK.

Cattle.—Normally rains should have fallen and the veld should be plentiful now. Beyond careful dipping, ranchers should not have much worry. If the season is bad, the poorer cattle should be drafted out and given a little hay, ensilage or mealies daily. Dairymen will not require to feed much succulent food, and usually the more expensive protein foods may be considerably curtailed at this time, but good sweet hay and mealies will be found to be very beneficial to milch cows, even if the veld is very plentiful. Clean dry sleeping places for both cows and calves will pay handsomely for any extra trouble involved. Young calves do not need to walk far, and in wet weather are much best in a clean dry pen. Watch for ticks.

Sheep.—Keep the sheep on high dry land. Be careful to keep the ticks down. Be sure the kraal or sheep shed is dry and clean, and that there is shelter from the rain for young lambs.

TOBACCO.

Continue to sow seed beds, watering, etc. When early beds become overgrown and hard, pull out, dig up and re-sow. Begin transplanting with the first good rains, and continue as fast as the rains and planters will allow, until the crop is set out. Be careful to fill in the misses from previous transplanting before starting on new fields; use the stoutest and best plants for filling in, and try to get the tobacco from any one field to grow and come to maturity as near at the same time as possible. Discontinue filling in when the field has been planted for several weeks and has made a good start to grow, as the later filled in plants will be choked out by the earlier ones, and will not come to maturity. Cultivate fields as soon as plants are established, to keep down weeds.

VETERINARY.

Early heavy rains might bring on horse-sickness before its usual time, but as a rule it need not be feared till the first rains are over in December.

WEATHER.

The rains should be commencing, if not already begun; occasionally they have delayed until December, and even later, before setting in properly. Between spells of wet weather lasting several days, fine dry periods occur, at first clear, but later cloudy and thundery, gradually gathering to burst in thunderstorms. The mornings are generally fine, and rain falls chiefly in the afternoon or evening. Heavy downpours are to be expected, and should be provided against beforehand by means of ditches and embankments, and by clearing water ways and furrows.

In a normal season the rainfall varies from two-and-a-half to three inches in Matabeleland, and from three-and-a-half to four inches in Mashonaland generally, with the exception of the eastern border, where it amounts to five inches.

Between the rain periods and prior to the commencement of the rains, severe heat is likely to be experienced.

December.

BEE-KEEPING.

With a normal season the first or main honey-flow of the year should now be over and the honey ready to be robbed. Before doing this, see that all or the main portion of the frames are capped and sealed, otherwise there wi.l be trouble later on by fermentation. There is nothing on the market to equal the Porter bee-escape board to clear out the bees from the crate, but be sure and see that the board in question is placed the right side up under the crate; failure to do this (and in the hurry of the minute it can easily be so done) will result in the probable suffocation of the bees and the loss of the honey, to say nothing of the chances of robbing from any close-by hives. Replace the empty combs and frames as soon as possible on the hives, to be cleaned up and mended where necessary, and for future storage of more honey. During the very hot spells watch the hives and provide extra venti!ation, by inserting small metal wedges between the crates, just wide enough to allow air in, but not a bee under any consideration. Keep all water tins under the hive-stand legs full of water, and see that water is available for the worker bee, which drinks a good deal. When extracting honey, do so in a bee-tight room or verandah, otherwise the operator may have a lot of trouble from other colonies, which quickly find where honey is. Always have one or more crates of shal!ow frames ready with foundation fixed to place on hives as the season may warrant; such will mean always something for the bees to work at, and during the last flow they may be invaluable to store any such catch crop of nectar, as from tobacco, etc., when the natural flora is finished.

CITRUS FRUITS.

This is a good month to plant citrus trees into their permanent positions. They should on no account be planted deeper than they stood in the nursery. Water each tree immediately after planting it to settle the soil, then loosen the surface when sufficiently dry to check weed growth and restrict evaporation; continue loosening the surface soil after each rain or watering. If good rains have fallen, disc the grove in two directions, then sow the cover crop and harrow also in two directions. If the grove is weedy it should receive a shallow ploughing in place of the discing. Then sow the seed and harrow the soil. All bearing trees must be kept well watered if the weather continues to remain dry. Trees that suffer for want of moisture whi!e the young fruit crop is developing will be adversely affected, and the crop—if any—will be of inferior quality. Continue to rub off all water shoots or suckers which develop on the tree stems.

CROPS.

Keep the cultivators going, both on planted and unplanted lands, whenever weather conditions are favourable. Destroy the weeds while young and before they obtain a firm root-hold.

Continue planting maize, cotton, beans and ground-nuts as early as possible this month, followed by sunflowers, Sudan grass, manna, pumpkins and cattle melons. Linseed, cowpeas, teff grass, oats, Sunn hemp should be planted after the other crops are in. Ensilage crops may be sown at the end of the month. When harrowing maize after p!anting, this work should be done in the heat of the day when the young plants are flaccid and not easily broken. On lands not yet planted the crop of weeds should be kept down by disc-harrowing. It is a good plan to harrow or disc-harrow immediately before the planter, or alternative!y to follow the p!anter with a light harrow. Treat seed oats for smut before sowing. Use one pint of formalin to 25 gallons of water and steep the bag of seed for ten minutes. Earth up early planted potatoes. Keep a look out for the

stalk-borer, and top or otherwise treat affected plants. New lands and old pastures may be broken, as circumstances permit, during December, January and early February, and again ploughed in from May to July. If they carry a heavy crop of grass it should be cut or burnt to enable good, clean ploughing to be done. Sweet potato slips should be planted early in this month. Do not fail to have in a few acres of this valuable crop.

DAIRYING.

During the months of December and January veld grazing is usually plentiful, and very little extra feed in the form of concentrates is required for dairy stock. It should be borne in mind, however, that heavy milking cows are unable to satisfy their requirements for milk production from veld grazing alone, and should receive a daily allowance of grain; the latter should be fed at the rate of 2 lbs. for every gallon of milk produced daily, i.e., a cow producing three gallons of milk should receive 6 to 7 lbs. of concentrates. An excellent mixture for this purpose is one consisting of four parts maize meal and one part ground-nut cake.

During wet weather, the provision of a clean dry shelter for calves is essential; the latter should not be crowded together in a small, damp, badly ventilated pen or muddy kraal. When treated in this manner, a calf is very liable to contract various ailments such as scour, etc. Scour is entirely preventable, and is usually caused by over feeding, or feeding from dirty pails, feed boxes, etc. Calves which contract scour should be isolated, the milk ration reduced, and they should be dosed with a few tablespoonfuls of castor oil.

Under the weather conditions which now obtain, cream should be despatched to the creamery at least three times a week. It is of the greatest importance that cream should be cooled immediately after separation, and should be kept cool while on the farm and whilst in transit to the railway station or siding. While the cream is being cooled, it should be frequently stirred, using a stirrer with a plunger attachment. Warm, freshly separated cream should not be mixed with old cream which has already been cooled. Cool the fresh cream first and then mix thoroughly with the old cream. Gassiness is a common defect in the cream received at the creameries at this time of the year, and is caused by gas-producing organisms with which the milk and cream are contaminated. These organisms abound in mud, manure, etc., and develop and multiply very rapidly at high temperatures. Any precautions therefore which may be taken to eliminate dirt, manure, etc., from the milk and to keep the cream cool will prevent the development of gassiness.

As the night temperatures are fairly high, cheese-makers should not attempt to use night's milk for cheese-making; morning's milk plus a starter will give the best results. Gouda cheese-making operations are not usually successful at this season of the year, owing to the poor quality of the milk and the prevalence of gassiness. This type of cheese is best manufactured during March and subsequent months.

DECIDUOUS FRUITS.

Cover crops may be planted when the rains commence, as recommended under citrus fruits. Summer pruning may be commenced this month. If all undesirable shoots are taken out of the trees, the remaining shoots will receive sufficient air and light to mature. Ripening fruit must be carefully harvested, graded and packed if satisfactory prices are to be secured. Do not gather any fruit when it is wet. Keep all recently planted trees in good condition; the first year's growth is the most important. If the undesired shoots are rubbed off when they first appear, the retained shoots will receive all the nourishment and the tree will then grow to a large size.

ENTOMOLOGICAL.

Maize.—The first half of this month appears to be the best period during which to plant maize for the avoidance of stalk borer attack—at

least in the Salisbury district. Hoe out and remove volunteer maize plants before the new crop is up, as they are liable to be infested with borer, which tends to spread to surrounding plants. Red soils may be baited with chopped Napier fodder or other suitable greenstuff dipped in arsenite of soda 1 lb., cheapest sugar 8 lbs. or molasses 1 gallon, water 10 gallons, to destroy surface beetles, snout beetles and other insects which may affect the primary stand.

Tobacco.—The enemies of this crop are in general most active during December, whilst the crop is still in the early stages of growth.

For information regarding tobacco pests, see "Rhodesia Agricultural Journal," January, 1928, or Bulletin No. 665.

In general, poisoned baits may be used against surface beetles, grasshoppers, crickets and cutworms. Against surface beetles, arsenite of soda 1 lb. in 30 gallons of water used to moisten maize bran is a good bait. Against grasshoppers and crickets the addition of 8 lbs. sugar or 1 gallon molasses to each 1 lb. of arsenite of soda is recommended. Spray with arsenate of lead (powder) 1 lb. in 30 gallons of water against leaf-eating insects and as a protection against leaf miners and stem borer. Transplants may be dipped head downwards as far as the roots in the poison. Discard seedlings infested with stem borer and root gallworm.

Cutworms.—Keep ground around seed beds as free as possible from vegetation, to prevent female moths from laying eggs there. From the time the plants show foliage of the size of a sixpence they should be sprayed weekly with arsenate of lead (powder) 1 lb. to 30 gallons of water. This should prevent cutworms developing in the beds, as the young cutworms attack the leaves of the seedlings, and so ingest the poison.

House Flies.—With the coming of hot weather and the rains, house flies greatly increase, and should be kept out of dwelling houses by mosquito netting, or poisoned in the following way:—Dissolve 1 lb. of sodium arsenite in 10 gallons of water, and add about 10 lbs. of cheap sugar (2 gallons of treacle) or other sweet substance. The mixture should be sprayed upon branches of shrubs or trees, which may be hung up in convenient places where flies congregate. These insects are attracted to the bait, and are easily poisoned.

Mosquitoes, Stable Flies.—Destroy breeding places around homestead. Poison or trap adults.

Potatoes.—Ladybirds and caterpillars may be injurious to the foliage, and on sandy soils blue blister beetles sometimes cause damage. Spray with arsenate of lead (powder) 1 lb. to 25 gallons of water.

Kitchen Garden.—Marrows, etc., are commonly attacked by leaf-eating beetles. Spray with arsenate of lead (powder) 1 lb. in 25 gallons water, plus 8 lbs. cheapest sugar or 1 gallon molasses. Dusting lightly with pure arsenate of lead powder should give protection. Young plants of the cabbage family may be dusted with pure arsenate of lead powder or with such powder mixed with up to six or eight parts of finely sifted, thoroughly slaked lime as a protection against leaf-eating insects.

Fruit Trees.—The regular collection and destruction of fruit beetles may be necessary. Choice varieties of peaches, etc., may be netted as a protection against pests.

FLOWER GARDEN.

This month is generally showery, and constant stirring of the soil is, therefore, necessary to keep it loose. Seeds of perennials and annuals for February blooms may be sown. Transplanting should be done in the evening or on a cloudy day. Carnations should be kept free from dead wood, and climbers attended to.

VEGETABLE GARDEN.

All vegetable seeds may be planted. All advanced plants should be constantly cultivated. Potatoes should be ridged, and peas, beans and tomatoes staked. This is a good month for planting the main crop of potatoes.

FORESTRY.

Final preparations for planting should be made, including harrowing or pitting. Early plantings may be carried out if the season is a good one. Planting should be carried out on dull, rainy days, or failing such days, late in the afternoons. Great care should be exercised in planting out to avoid bending the tap root, and to set the trees in the ground at the same level as they were in the seed bed or tray. Late sowings of Cedrela toona seed may be made.

POULTRY.

The poultry keeper should take precautions whereby the wet weather will not affect his birds' health and their laying powers. All houses must be absolutely watertight, the floor raised well above the level of the surrounding ground, thus preventing water seeping in and making it damp. The birds themselves should not get wet, and no pools of water should be seen in the runs. Foodstuffs also must be kept absolutely dry.

Many birds will at present be moulting; these require special treatment to bring them through it quickly, and if possible keep them in lay during the period. A pamphlet on this can be obtained from the Poultry Expert, Department of Agriculture. This lack of attention to the birds during the moult is one of the causes of the scarcity of eggs at this season. There is no need for it if poultry keepers would only look after their birds properly.

Those who intend disposing of their turkeys for killing at Christmas must avoid cooping them up, as is done when fattening fowls, for they immediately mope and go off their food. Give them free range, and in addition to their usual evening feed of maize, during the first week of December give one of wheat or maize in the morning, and during the second and third weeks three meals a day, each one containing, in addition to wheat or maize, some crushed monkey nuts or sunflower seeds. Plenty of thick milk and chopped-up onions or onion tops should also be given.

Those who go in for ducks should feed well and get as many to marketable size as possible by Christmas, when they usually fetch good prices. They should be kept in a small run; nearly all their food should be wet mash, bran, pollard, maize meal, meat meal and milk, as much as they will eat three times a day, i.e., they should practically be allowed to spend their existence eating and sleeping. Big duck breeders often give a fourth meal by lamplight at 10 p.m., and the first meal is given at sunrise.

STOCK.

Cattle.—Ranching cattle should not require any attention beyond dipping, but any stock that are in weak condition will be the better for a little hay or a pound or two of maize at night until they have regained strength. The bulls should be returned to the herd either at the end of the month or in January, and it should be remembered that the better they are conditioned and fitted for their work the more hope there is of a good crop of calves. For this reason also every effort should be made to have all the female stock in strong condition. Dairymen will find that as the grass becomes lush and rank a supply of sweet veld hay, teff hay or, say, three pounds of crushed maize given in the sheds at night will enhance both the quality and quantity of the milk. This will be found to be the case more particularly in districts of heavy rainfall. Milch cows should be protected as much as possible from cold rains and hot sun. Yarding all night in a clean kraal provided with a simple lean-to shed well bedded up will be found to be very beneficial in seasons of

protracted rainfall. The calf pen should be kept clean, dry and sweet, and young calves will be better kept in during very hot or very wet weather. Dipping should be regularly attended to.

Sheep.—Graze on the higher lands, keeping the kraals clean, dry and airy, and watch for ticks.

TOBACCO.

Continue preparation of land. The best results are obtained by transplanting on well prepared soil. Transplanting should be pushed on with as fast as transplants and climatic conditions will allow. As soon as plants begin to grow, go over the field and fill in all missing hills with strong selected plants, and then apply fertiliser to hasten growth and ensure early maturity. Cultivation should be commenced as soon as the plants start growing, especially on sandy soils. The crust caused by heavy rains should be pulverised through cultivation as soon as the surface soil is dry enough for tillage; this gives the young plants the benefit of the moisture stored in the soil. Do not neglect the late sown seed beds. Make every effort to finish transplanting before the end of the month, so that the crop will be harvested before dry, cool weather begins.

VETERINARY.

Occasional cases of horse-sickness may occur during this month. With the great increase in ticks, due to the heat and moisture, cases of redwater and gall-sickness may be expected, more especially amongst Colonial stock imported since the last rainy season. The cool weather which frequently follows the early rains is an excellent time for castrating calves and other animals.

WEATHER.

In Mashonaland the rainfall during this month varies from eight inches along the eastern border to six inches in the west. In Matabeleland it varies from five-and-a-half inches in the west to four-and-a-half inches in the south. Considerable divergencies from these normals may occur in individual seasons, but on the whole this month is the most regular in its behaviour. Very heavy downpours may be looked for, and it is well to be provided by drains and ditches against the effects of very heavy rain storms. A dry spell about Christmas time is a very frequent, though not invariable, event in Rhodesia. This partial drought may last only a fortnight, or may extend to six weeks, in the latter event often causing some anxiety regarding young crops, especially those not yet through the ground. The best means of meeting this condition of the weather is by frequent surface cultivation by harrow or horse hoe to preserve a loose soil mulch on the surface and prevent losses of soil moisture by evaporation.

Southern Rhodesia Veterinary Report.

August, 1930.

AFRICAN COAST FEVER.

CHARTER DISTRICT.—The slaughter of the infected herd on the farm Inhoek was completed on 11th August.

MELSETTER DISTRICT.—About the middle of July the cattle on the farms Schaapplaats, Wolfscrag and Canterbury, a total of 1,010 head, were moved to the fenced farm Vleiplaats. The Canterbury herd included the cattle from the infected farms Morgenson and Enhoek that were moved to Canterbury in October last. Prior to removal, all animals were temperatured three times. Subsequent to their arrival at Vleiplaats, the process of temperaturing was continued for 28 days, during which period 4 head were destroyed on showing a temperature elevation. In addition, 76 head were slaughtered for local consumption and 10 head for the observation of the effects of certain drugs being experimented with in the treatment of gastric and intestinal parasitic infestations of cattle and sheep. Smears were taken from every beast and examined microscopically, with negative results. This work was carried out by three cattle inspectors with 20 natives, under the supervision of the District Veterinary Surgeon.

On the 16th August the three herds were moved from Vleiplaats by the Sabi road and arrived at Gilmerton, a farm about 16 miles from Umtali, on the 28th idem. The three herds travelled separately, each being in charge of a cattle inspector, with 20 natives in all as herds. A donkey wagon and 10 boys accompanied the trek, carrying wire for the erection of three kraals every night. All animals were temperatured and dipped at Hot Springs, about half way to Gilmerton, under the supervision of the District Veterinary

Surgeon, Melsetter, and again on arrival at Gilmerton under the supervision of the District Veterinary Surgeon, Umtali.

From date of leaving Vleiplaats until arrival at Gilmerton, 15 head were destroyed, viz., one for rise of temperature and the balance for lameness and poverty.

Arrangements were completed for the despatch of these animals by rail to the cold storage abattoirs, Bulawayo.

QUARTER EVIL.

A few cases reported.

TRYPANOSOMIASIS.

Two head of cattle died in the Melsetter district.

SCAB IN SHEEP.

One outbreak in the Melsetter district and one in the Charter district.

TUBERCULOSIS.

Two cows tested at Bulawayo on importation re-acted, and were kept over for a re-test.

IMPORTATIONS.

From Union of South Africa: Bulls, 8; cows, 44; horses, 57; mules, 12; donkeys, 36; sheep, 1,452. From Bechuanaland: Sheep, 690; goats, 407; pigs, 42.

EXPORTATIONS (CATTLE).

To Union of South Africa: For local consumption, 1,661; Durban, for overseas, 5,939. To Belgian Congo: Slaughter, 2,673. To Northern Rhodesia: Slaughter, 332. To Portuguese East Africa: Breeding, 7.

EXPORTATIONS (MISCELLANEOUS).

To Northern Rhodesia: Sheep, 318; goats, 51; pigs, 131. To Belgian Congo: Sheep, 35; goats, 20; pigs, 169.

J. M. SINCLAIR,
Chief Veterinary Surgeon.

Southern Rhodesia Weather Bureau.

SEPTEMBER, 1930.

Pressure.—The mean barometric pressure for the month was about normal, varying from 0.018 in. below normal at Bulawayo to 0.016 in. above normal at Livingstone.

Temperature.—The mean temperature for the month was below normal, varying from 3.8° F. below normal at Riverdene North to 0.7° F. above normal at Salisbury. The mean maximum temperatures were mostly below normal, varying from 4.0° F. below normal at Riverdene North to 1.9° F. above normal at Empandeni. The mean minimum temperatures were also below normal, varying from 4.0° F. below normal at Bulawayo to 1.5° F. above normal at Salisbury.

Relative Humidity was everywhere below normal.

Snow.—The meteorological observer at Brackenbury, Melsetter, reports 0.23 in. of rain, accompanied by snow, on the 15th September. The observer at Orangedale, Insiza, also reports 0.10 in. of rain, accompanied by melting flakes which appear to have been snow.

These observations were not made at fully equipped stations unfortunately. The weather map of the day shows an anti-cyclone of considerable dimensions entering Southern Rhodesia from the south, having displaced a low which was central on the 14th. The whole of the southern and eastern portions of the country was overcast with stratus cloud, with strong southerly to south-easterly winds. The air temperature at 9 a.m. at 1,500 metres altitude was 39° to 40° F.

This anti-cyclone accompanied what is probably the coldest spell of weather recorded in this Colony in September.

RAINFALL.

ZONE A.—	
Insiza—	
Orangedale	0.10
ZONE B.—	
Belingwe—	
Bickwell	0.08
Bulalima-Mangwe—	
Brunapeg	0.07
Semokwe Reserve	0.02
Chibi—	
Bubye	0.11
Nuanetsi Homestead	0.22
Nuanetsi N.C.	0.22
Gwanda—	
Tuli	0.01
Insiza—	
Albany	0.05
Scaleby	0.02
ZONE C.—	
Charter—	
Marshbrook	0.57
The Range	0.18
Gwelo—	
Lalapanzi	0.03
Wold Farm	0.06
Hartley—	
Cromdale	0.02
Elvington	0.07
Freshaye	0.37
Gowerlands	0.26
Hopewell	0.18
Meadowlands	0.13
Nyadgori	0.16
Thorndyke	0.03
Lomagundi—	
Argyle	0.16
Baguta	0.08

Between Rivers	0.02
Darwendale	0.26
Dingley Dell	0.10
Kashao	0.26
Maningwa	0.11
Montrose	0.47
Robbsdale	0.20
Umvukwe Ranch	0.11
Marandellas—	
Rocky Spruit	0.75
Salisbury—	
Agricultural Exp. Station	0.15
Avondale (Broadlands)	0.17
Cleveland Dam	0.33
Forest Nursery	0.17
Agricultural Department	0.12
Sebastopol	0.49
Tobacco Exp. Station	0.12
Western Commonage	0.14
ZONE D.—	
Inyanga—	
Juliasdale	0.20
Mazoe—	
Bellevue	0.01
Ceres	0.29
Citrus Estate	0.03
Craigengower	0.05
Donje	0.15
Frogmore	0.22
Glen Divis	0.06
Glen Grey	0.01
Kilmer	0.03
Maienzi	0.05
Ruia	0.20
Sunnyside	0.03
Salisbury—	
Arcturus	0.26
Hillside (Bromley)	0.49
Kilmuir	0.31
Meadows	0.30

Pendennis	0.18
Springs	0.55
Teviotdale	0.21
Vainona	0.20
ZONE E.—	
Belingwe—	
Belingwe N.C.	0.05
Doro	0.07
Bikita—	
Angus Ranch	0.16
Bikita	0.99
Chilimanzi—	
Allanberry	0.05
Driefontein	0.12
Induna Farm	0.04
Mtao Forest	0.12
Mukowries	0.03
Gutu—	
Glenary	0.08
Gwelo—	
Sheep Run Farm	0.08
Inyanga—	
St. Trias' Hill	0.75
Insiza—	
Stoneham (Brae Valley)	0.07
Makoni—	
Craigendoran	0.21
Kairidzi	0.19
Mona	0.50
Monte Cassino	0.06
Rusape N.C.	0.16
Springs	0.12
Marandellas—	
Bonongwe	0.17
Delta	0.22
Lushington	0.11
Marandellas N.C.	0.18
Nelson	0.07
Wedza Reserve	0.38

Melsetter—	
New Year's Gift	0.32
Ndanga—	
Doornfontein	0.21
Zaka	0.41
Selukwe—	
Aberfoyle Ranch	0.05
Safago	0.08
Selukwe Gaol	0.35
Umtali—	
Argyll	0.26
Embeza	0.30
Fern Valley	0.33
Jerain	0.32
Mountain Home	0.40
Odzani Power Station	0.45
Park Farm	0.80
Premier Estate	0.32
Sarum	0.29
Sheba	0.11
Stapleford	0.29
St. Augustine's Mission	0.35
Umtali Gaol	0.46
Victoria—	
Cambria	0.04
Chevenden	0.42
Riverdene North	0.08
ZONE F.—	
Melsetter—	
Chikore	0.82
Chipinga	0.34
Lettie Swan	0.30
Melsetter	0.57
Mount Selinda	1.26
Umtali—	
Cloudlands	0.67

Export of Cattle from Southern Rhodesia, 1930.

Month	Union		England.	Congo		N. Rhodesia.		Portuguese East Africa.		Total
	Slaughter		Slaughter							
	Union of S.A.	I.C.S. for overseas	On hoof	Slaughter	Breeding	Slaughter	Breeding	Slaughter	Breeding	
January ...	...	...	...	2,449	67	...	...	...	...	2,516
February ...	...	...	..	3,438	8	537	91	...	11	4 085
March ...	25	...	160	1,097	...	249	...	...	7	1,538
April ...	53	863	...	2,636	115	120	16	...	...	3.803
May ...	783	1.628	160	1,517	593	268	176	...	...	5,125
June ...	1,132	2.660	...	1,810	11	407	...	...	...	6,020
July ...	1,273	5.505	...	1,525	2,257	299	128*	...	...	10,987
August ...	1,661	5,939	...	2,673	...	332	...	...	7	10,612
September ...	1,031	2,871	...	2,440	60	460	30	...	...	6,892
October ...										
November ...										
December ...										
	...	...	...	...	...	...	...	...	...	...

* Trek oxen.

Departmental Bulletins.

The following Bulletins, consisting of reprints of articles which have appeared in this Journal, are available for distribution free of charge to applicants in Southern Rhodesia only. Outside Southern Rhodesia, 3d. per copy.

AGRICULTURE AND CROPS.

No. 174. Notes on Hop Growing, by H. G. Mundy, F.L.S.

No. 225. Napier Fodder or Elephant Grass, by J. A. T. Walters, B.A.

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No. 561. Wheat Growing in Rhodesia, by C. Mainwaring.

No. 568. The Treatment of Arable Land, by G. N. Blackshaw, O.B.E, B.Sc., F.I.C.

No. 581. Leguminous Crops for Stock and Soil Improvement in Southern Rhodesia, by C. Mainwaring, Agriculturist.

No. 590. Rye, by H. W. Hilliard, Junior Agriculturist.

No. 591. Maize Export Conference Proceedings.

No. 598. Drought-resistant and Early-maturing Crops for Areas of Late Rainfall, by C. Mainwaring.

No. 599. Rhodesian Soils and their Treatment, by E. V. Flack.

No. 601. Maize for Export, by S. D. Timson.

No. 603. The Production of Maize in Southern Rhodesia, by C. Mainwaring, Agriculturist.

No. 630. The Storage of Seed Potatoes, by H. C. Arnold.

No. 634. Barley, by P. V. Samuels.

No. 643. Noxious Weeds in Southern Rhodesia, by F. Eyles, Botanist.

No. 650. Coffee Culture in Southern Rhodesia, by G. W. Marshall, Horticulturist.

No. 651. Two Important Leguminous Crops: The Velvet Bean and Dolichos Bean, by C. Mainwaring, Agriculturist.

No. 656. Tractor Notes, by A. W. V. Crawley, M.E., F.G.S.

No. 657. Hay-making in Southern Rhodesia, by C. Mainwaring, Agriculturist.

No. 663. The Use of Fertilisers and Manures in Southern Rhodesia, by A. D. Husband, A.I.C., Chief Chemist.

No. 672. Hay-making in Rhodesia, by H. G. Mundy, Dip.Agric., F.L.S.

No. 674. Top Dressing of Maize against Stalk Borer, by H. C. Arnold.

No. 681. The Sunflower (Helianthus Annuus) (Revised), by S. D. Timson, M.C., Dip.Agric.

No. 684. Warning to Maize Growers: Maize for Export.
No. 685. Notes on Farm Practice at the Government Farm, Gwebi, by S. D. Timson, M.C., Dip.Agric.
No. 694. The Edible Canna (Canna Edulis), by D. E. McLoughlin.
No. 695. The Castor Oil Plant (Ricinus spp.), by S. D. Timson, M.C., Dip.Agric.
No. 697. Results of Analysis of Samples taken under the "Fertilisers, Farm Foods, Seeds and Pest Remedies Ordinance" during the year 1927-28.
No. 700. Further Notes on Farm Practice at the Government Farm, Gwebi, by S. D. Timson, M.C., Dip.Agric.
No. 704. The Importance of Research on Pasture Improvement in Southern Rhodesia, by A. D. Husband, A.I.C., Chief Chemist.
No. 705. Suggested Cropping Programmes for Farms on the Sand Veld, by D. E. McLoughlin, Assistant Agriculturist.
No. 706. A Farmers' Calendar of Crop Sowings, by C. Mainwaring, Agriculturist.
No. 708. Witch Weed or Rooibloem (Striga Lutea)—a Serious Menace to Maize, by J. A. T. Walters, B.A., F.R.S.A., Agriculturist.
No. 709. Sand Veld Farming and its Possibilities, by E. D. Alvord, M.Sc. (Agr.).
No. 710. Monthly Reminders for the Farming Year, by the Division of the Chief Agriculturist.
No. 713. Ensilage, by J. A. T. Walters, B.A., Agriculturist.
No. 724. Ploughing by Tractor, by A. W. V. Crawley, M.E., F.G.S.
No. 727. Farmyard Manure, by A. P. Taylor, M.A., B.Sc., Agricultural Chemist.
No. 732. Two Common Diseases of Potato Tubers in Rhodesia, by J. C. F. Hopkins, B.Sc. (Lond.), A.I.C.T.A.
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No. 750. Cotton in Southern Rhodesia—Hints to Growers, by G. S. Cameron, Empire Cotton Growing Corporation.
No. 751. The Sweet Potato, by S. D. Timson, M.C., Dip.Agric. (Wye).
No. 757. Maize on the Sand Veld: Results at the Tobacco Experiment Station, Salisbury, by C. A. Kelsey-Harvey, Manager.
No. 758. Instructions for Taking Soil Samples. Issued by the Division of Chemistry.
No. 759. Witch Weed (Striga Lutea): Methods of Control, by S. D. Timson, M.C., Dip.Agric. (Wye).
No. 762. The Value of Rock Phosphate and "Bone and Superphosphate" as Fertilisers for Maize Production, by A. D. Husband, Chief Chemist.
No. 768. The Ground Nut (Arachis hypogaea), by S. D. Timson, M.C., Dip.Agric. (Wye).
No. 775. Agricultural Costings at the Gwebi Farm, by H. G. Mundy, Dip.Agric., F.L.S., Chief Agriculturist, and J. Hick, Accountant.
No. 776. Regulations Governing the Export of Maize and Maize Meal through the Port of Beira.
No. 777. Some Aspects of Cost of Production Studies in Agriculture, by Arthur G. Ruston, D.Sc., Department of Agriculture, Leeds University.
No. 781. Agricultural Costings at the Gwebi Farm—Maize and Green Manuring, by H. G. Mundy, Dip.Agric., F.L.S., Chief Agriculturist, and J. Hick, Accountant.
No. 783. Agricultural Costings at the Gwebi Farm—Fattening for Beef, by H. G. Mundy, Dip.Agric. (Wye), F.L.S., Chief Agriculturist.
No. 787. Agricultural Costings at the Gwebi Farm—Ground Nuts and Maize and Beans for Silage, by H. G. Mundy, Dip.Agric. (Wye), F.L.S., Chief Agriculturist.

No. 793. Agricultural Costings on the Gwebi Farm, by H. G. Mundy, Dip.Agric., Chief Agriculturist.

No. 794. Some Further Notes on Cotton Growing in Southern Rhodesia, by G. S. Cameron.

Botanical Specimens for Identification.

Accelerating the Sprouting of Potatoes.

REPORTS ON CROP EXPERIMENTS.

No. 94. Second Report on Experiments, by J. H. Hampton.

No. 216. Manuring of Maize on Government Experiment Farm, Gwebi, by A. G. Holborow, F.I.C.

No. 220. Reports on Crop Experiments, Gwebi, 1914-15, by E. A. Nobbs, Ph.D., B.Sc.

No. 221. Results of Experiments, Longila, 1914-15, by J. Muirhead.

No. 239. Reports on Crop Experiments, Gwebi, 1915-16, Part I., by E. A. Nobbs, Ph.D., B.Sc.

No. 246. Report on Crop Experiments, Gwebi Farm, Season 1915-16, Part II., by E. A. Nobbs, Ph.D., B.Sc.

No. 268. Manuring Maize, Government Farm, Gwebi, by A. G. Holborow, F.I.C.

No. 279. Report on Crop Experiments, Gwebi, 1916-17, by E. A. Nobbs, Ph.D., B.Sc.

No. 341. Report on Crop Experiments, 1918-19, Gwebi Experiment Farm.

No. 342. Rotation Experiments, 1913-19, by H. G. Mundy, F.L.S., and J. A. T. Walters, B.A.

No. 382. Annual Report of Experiments, Experiment Station, Salisbury, 1919-20.

No. 405. Annual Report of Crop Experiments, 1920-21, Gwebi Experiment Farm, by H. G. Mundy, F.L.S., and J. H. Hampton.

No. 411. Annual Report of Experiments, 1920-21, Experiment Station, Salisbury, by H. G. Mundy, F.L.S.

No. 413. Arlington Sand Veld Experiment Station, First Report, by H. G. Mundy, F.L.S., and E. E. Wright.

No. 432. Bulawayo Municipal Experiment Station, First Report, by H. G. Mundy, F.L.S.

No. 433. Winter Cereal Experiments, 1921, by D. E. McLoughlin.

No. 437. Annual Report of Crop Experiments, Gwebi Experiment Farm, 1921-22, by H. G. Mundy, F.L.S.

No. 440. Annual Report of Experiments, 1921-22, Experiment Station, Salisbury, by H. G. Mundy, F.L.S.

No. 485. Annual Report of Experiments, 1922-23, Agricultural Experiment Station, Salisbury, by J. A. T. Walters, B.A.

No. 486. Bulawayo Experiment Station, Annual Report for Season 1922-23, by H. G. Mundy, F.L.S.

No. 514. Bulawayo Experiment Station Report, 1923-24, by H. G. Mundy, F.L.S.

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THE RHODESIA

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Editorial.

Contributions and correspondence regarding subjects affecting the farming industry of Southern Rhodesia are invited. All communications regarding these matters and advertisements should be addressed to:—The Editor, Department of Agriculture, Salisbury.

The Prince Edward Dam.—The Prince Edward Dam, illustrated on the opposite page, is situated on the Hunyani River approximately half a mile west of the drift on the old Charter Road and twelve miles south of Salisbury. For some years past, owing to the growth of the town, the Municipal Council realised that it was necessary to provide an augmented water supply to meet the increased demand for water which Cleveland Dam was unable to supply. The Government assisted the Council by allowing its irrigation engineers to make preliminary investigations as to the best source of supply. Their conclusions were that the Hunyani River was the only reliable source within reasonable distance of the town. Council accepted their selection and ultimately engaged Mr. George A. Stewart, Consulting Water Engineer to the Bulawayo Council, to prepare an augmentation water

scheme on the Hunyani River. After very thorough investigations, Mr. Stewart submitted a report to Council in which he concurred with the conclusions of the Government irrigation engineers, and outlined the scheme as now in operation at an estimated cost of £120,000.

We are indebted to the Town Engineer, Mr. S. W. S. Morris, for the following particulars:—

The works at the river include the dam, pump house, pumps, measuring weirs and automatic recording gear, and caretaker's cottage. The dam wall is of the gravity section type constructed of mass concrete, and though on plan it would appear to be of an arch type, it is not so. The curve in the wall was adopted on account of the best rock foundation existing along that route. Flood discharge is provided for by one 30 feet by 20 feet sluice gate, operated by a counter weight and head-stock fixed approximately in the centre line of the stream, as well as over the whole length of the top or crest of the wall.

The sluice gate opens automatically, and can be set to open at such depth of water flowing over the crest of the wall as may be decided upon. The gate has to be closed by hand power—an operation which takes about 35 minutes when it has been opened to its fullest extent. In addition to functioning as an outlet for flood water, the gate will allow of any accumulation of silt which may collect on the upstream side of the wall being discharged, and thus prevent reduction in storage capacity of the dam.

Access to the super-structure is obtained from the pump house by means of a tunnel, terminating at a ladder-way leading up to the top of the gate pier on the north bank of the river.

The tunnel also houses the suction pipe through which the pumps draw water from the dam, also the valve on the pipe which discharges the compensation water down the river.

The crest of the dam is well over 1,000 feet in length and is 4,648 feet above sea level. Its capacity when full is just under 500,000,000 gallons; the surface area is about 192 acres.

The distance from the wall to the head waters of the dam is about three miles. At this point a measuring weir has been erected, in order to ascertain the quantity of water

entering the dam, for, under the special Act of Parliament sanctioning the scheme, Council has to discharge a certain quantity of water out of the dam for the benefit of lower riparian owners. The quantity discharged is measured by the weir situated a short distance below the dam wall and in close proximity to the suspension bridge. This bridge was erected to replace an old one situated about 200 yards up-stream from the wall. Therefore pedestrian traffic has the same facilities for crossing the river when it is in flood as existed prior to the building of the dam. Vehicular traffic, which formerly used the old drift now submerged, has been provided with a low-level concrete bridge immediately below the dam.

The pump house, situated towards the northern end of the wall, houses two multi-staged centrifugal pumps, each having a capacity to deliver 750 gallons per minute into the purification works situated on the Salisbury Kopje. The pumps are driven by electric motors, each 260 h.p., coupled direct to the pumps. Electric current is supplied to the motors from Council's power station in town through an over-head transmission line at a voltage of 11,000; on arriving at the pump house, this voltage is reduced to one suitable for the motors. Owing to the limited capacity of the town electrical power station, pumping can only be done at night time, but with the inauguration of the new electrical power station, it will be possible in the very near future to pump any time during the 24 hours.

Sericulture in Southern Rhodesia.—We publish else-where in this issue of the Journal a summary of Mr. Breton's report on the prospects of establishing a silk worm industry in this Colony, and the recommendations made by him to Government.

The main points that emerge from the report are that the climatic conditions here appear to be satisfactory for the successful rearing of silk worms and that no difficulty should be experienced in establishing the right kind of mulberry tree for feeding the insects. Mr. Breton considers, however, that the industry stands little chance of success if it is confined exclusively to the European or native popu-

lation. The financial return from sericulture is so small that farmers would not consider it worth the time spent on it, but Mr. Breton considers that by utilising native labour at the time when farming operations are at their lowest ebb, which coincides with the period of silk worm activity, it might be an economic proposition to start an industry. Mr. Breton thinks it possible to proceed on the lines of what, for lack of a better term, he calls a silk worm village, which should develop slowly and surely. Thus, from small beginnings, the enterprise would be built up with the economic use of farm labour, until eventually the income would be sufficient to justify the attention paid to it. Mr. Breton explains his meaning very clearly, and it is for farmers to decide whether they consider sericulture offers a reasonable return as a side-line to their main farming operations.

We are authorised to state that, if sufficient interest is shown, the Government may consider some form of assistance to encourage a start at one centre of the Colony on the lines indicated by Mr. Breton, and anyone desirous of obtaining information on the subject should communicate with the Secretary, Department of Agriculture, Salisbury.

Britain's Food Supply.—The October issue of "Empire Production and Export," the official journal of the British Empire Producers' Organisation, is devoted entirely to a memorandum prepared by the organisation for submission to the delegates to the Imperial Conference, 1930. The memorandum comprises a series of reports (with statistics) dealing in detail with the food supplies of the British Empire, and contains information of great interest to producers overseas.

In regard to wheat and flour, we see that the United Kingdom in the year 1928 imported 131,024,000 centals of 100 lbs., of which 66,315,200 centals came from British countries. Of the imports from foreign countries, 36,743,600 centals came from the United States of America and 25,983,400 centals from the Argentine.

It is interesting to note that of the total quantity of 5,036,294 centals of wheat and flour imported into South

Africa, 4,275,049 centals came from British countries, Australia being responsible for 3,502,177 centals.

In 1928 the United Kingdom imported 12,534,647 cwts. of beef (fresh, chilled, frozen, boned, tinned, canned, etc.), of which 1,516,296 cwts. only came from British countries. Argentina supplied 9,703,903 cwts. of the total. The imports of mutton and lamb (fresh and frozen) into the United Kingdom in 1928 amounted to 5,643,492 cwts., of which British countries supplied 3,363,604 cwts., the chief source of supply being New Zealand with 2,794,805 cwts. The total imports of meat (beef, mutton and lamb) into the United Kingdom in the year 1928 amounted to 18,178,139 cwts., of which quantity 13,298,239 cwts. came from foreign countries.

Imports of cheese into the United Kingdom in the year 1928 totalled 3,005,237 cwts., of which 2,550,621 cwts. came from British countries, New Zealand being the principal supplier with 1,554,364 cwts. As regards butter, the position is reversed, for of a total importation of 6,112,972 cwts., foreign countries supplied 3,456,379 cwts. New Zealand headed the list of Empire suppliers with a total of 1,222,277 cwts., which compares with 872,885 cwts. from Australia and 559,167 cwts. from the Irish Free State. Denmark headed the list of all suppliers with a total of 2,016,045 cwts.

The extent of the egg trade will be realised from the fact that the United Kingdom in 1928 imported eggs to the extent of 26,466,490 great hundreds. Of this total, British countries supplied 5,880,529 great hundreds, the Irish Free State being responsible for 5,177,301 great hundreds. Incidentally, South Africa comes next with 338,804 great hundreds. Of foreign countries, Denmark sent 5,329,669, Belgium 2,907,901, Poland 2,561,969, Netherlands 2,725,247, Russia 1,766,845 and France 1,658,881 great hundreds.

The British Empire Producers' Organisation, after the most careful consideration, advocates a tariff on foreign foodstuffs, with free or preferential entry for Empire products, combined in appropriate circumstances with such measures as, for instance, seasonal regulation of imports, and, where the United Kingdom is a producer, with effective safeguards for the Home product.

This is the problem with which the Imperial Conference has been wrestling during its momentous session.

Our Exchanges.—A considerable number of periodicals dealing with agricultural subjects are received in this office from which we frequently extract information which may be of interest to our readers. A bright and informative publication entitled "Farm Notes," issued by Imperial Chemical Industries, Ltd., in England, has recently come our way, and we think it will be useful to refer to some of its contents.

It is observed that at the tractor trials entrusted to the Institute of Agricultural Engineering at Oxford by the Royal Agricultural Society last summer the American manufacturers apparently held their own with paraffin tractors, in which sphere they of course have a long start, although with Diesel engines running on crude oil the English makers were able to put up an excellent performance. In these types the fuel cost is reduced to a minimum and they are altogether most economical. There would appear to be a great future for the crude oil tractor in this Colony, a subject with which the Irrigation Engineer will deal in his notes in the next issue of the Journal.

Readers will be aware of the rigid system of bull inspection and licensing which is in force in the Irish Free State and Northern Ireland. It is interesting to note that as a result of the elimination of the scrub bull there is an all-round improvement in Irish store cattle shipped to England, an improvement which is reflected in the prices paid by the purchasers. At first bulls of good appearance and bone were granted licences, but now, with the exception of registered dairy stock, only pedigree bulls of real merit are accepted. This wise measure, although it involved some hardship when it was first introduced, is undoubtedly justified by results.

Considerable interest has been aroused in the south of England by the methods practised on the Ford farm at Dagenham, Essex. No horses are used for the farm work, and in fact there is no live stock of any kind on the place. Everything is done by power. The fertility of the soil is maintained by ploughing in green crops, and yields are increased by the judicious use of sulphate of ammonia. Last year 73 acres of wheat yielded over 8½ quarters per acre. The total crop realised £1,314 10s., or £18 per acre, and although no working costs are available, it would appear that with no horses to feed and a very small labour bill the enterprise is on the right road.

An article in the same publication on the pastures of New Zealand is of interest to us, in view of the experiments which are proceeding in this Colony, in co-operation with the Empire Marketing Board, to improve our native pastures. It is shown that great progress has been made in New Zealand and Australia in developing production from grassland. In both countries grass is by far the most important crop, being responsible for about 94 per cent. of New Zealand's exports and over 50 per cent. of those of Australia. The advent of the freezing industry undoubtedly gave the impetus, which has resulted in steady progress in the development of pasture production. In pre-refrigeration days grassland was of comparatively little importance, owing to the limited market for its products, whereas to-day it is of vital national importance.

Since 1900 the output of wool in New Zealand has increased by 80 per cent., and meat, mainly lamb, by 70 per cent. The output of butter is six times greater and cheese fourteen times greater than in 1900, and the amount of dairy produce exported has more than doubled since the war. Truly a performance to be proud of. The increase in production is directly due to better pasture management. It is stated that twenty years ago only a few acres of grassland were top dressed, whereas in 1929 fully 2¼ million acres in New Zealand were treated with fertilisers. The New Zealand Government has now instituted a scheme whereby true strains of the major grassland species will be certified and officially registered, which means that within a comparatively short time all the foundational material for high pasture production will be available to the farmer.

United States Farm Relief Bill.—In view of the measures which are being taken in various parts of the world to afford relief to agricultural workers, it is of interest to know what is being done in the United States of America. On 15th June, 1929, President Hoover signed the Farm Relief Bill, which he described as "the most important measure ever passed by Congress in aid of a single industry." At the same time he announced that he was asking Congress for

an immediate initial appropriation of 150 million dollars of the 500 million revolving fund authorised by the measure.

The object of the Bill is to enable operations to be begun without delay under the provisions of the Agricultural Marketing Act, dated 15th June, 1929, which is designed to help the American farmer to market his wheat and other products as advantageously as possible, and to provide for the distribution of surplus produce with a view to their more profitable disposal. For these purposes co-operative funds at low rates of interest will be provided. In short, it is proposed to regulate the market by systematically regulating supplies. The revolving fund will be used in loans to agricultural co-operative societies and stabilisation corporations for various commodities; it will be administered by a board to be known as the Federal Farm Board.

The administrative task which lies before the board is of much greater magnitude than anything of the kind hitherto attempted in the United States. In considering the Act under which the board has been created, four things must be kept clearly in view: (1) The Federal Farm Board; (2) the ultimate 500 million dollar revolving fund for loans; (3) the farmers' co-operative associations; and (4) the stabilising corporations. These comprise the fundamental framework of the new system.

Under the Act the Government will deal not with individuals, but with the farmers' co-operative associations, which have sprung up in thousands under what is known as the Capper-Volstead Act of 1922. All the co-operatives engaged in handling a certain commodity will have a commodity advisory committee. In other words, there will be one such committee for each commodity or crop—wheat, cotton, potatoes, pigs, sheep, etc. The commodity advisory committee will be composed of seven men, all producers of that particular commodity. These committees will act as intermediaries between the actual producers and the Federal Farm Board, which controls the revolving fund.

Every commodity too will have its stabilising corporation, which must be farmer-owned and farmer-controlled. Co-operatives must own the stock of the stabilising corporation, and the latter must be incorporated under the laws of

the State. The stabilising corporation has a two-fold function: (a) It may act as a marketing agency for the co-operatives of its commodity group, and (b) it may go out into the market in times of depression, and, with money furnished by the Federal Farm Board, buy up a surplus crop and store it while awaiting a better price, or sell it abroad if there is an advantage in so doing.

The board may lend money to a co-operative association on the security of the commodity in which they deal; such loans may bear interest up to 4 per cent. As regards the specific objects for which associations may obtain loans from the Federal Farm Board, they are of many different kinds. For instance, a co-operative association which handles wheat may find itself badly handicapped for want of an elevator, and may want money to build one. An application to the board may result in a loan equal to 80 per cent. of the value of the stored wheat and at a rate of interest between 3 and 4 per cent. Again, an association of pig breeders may decide that it would be more profitable to them to market their stock in the form of pig products than on the hoof; they too may apply to the board for money to set up a packing plant. A farmer who belongs to a co-operative association may haul a load of wheat to the co-operative warehouse and, by paying a small premium, take out insurance that will protect him against any drop in wheat below a stipulated price. If wheat falls below that price, what would otherwise be his loss will be made up out of the revolving fund; but if, on the other hand, wheat rises above the guaranteed price, the farmer, when he sells, will receive the benefit of that increase.

These are only a few typical examples of how the new Act will work. In fact, if a co-operative association wants money for almost any process of farming or marketing, it has only to make out a good case to the Federal Farm Board. The scheme is thus one of very great magnitude, and its practical working out will be watched with interest. That it presents elements of difficulty is obvious. One of the legislators who voted for the Bill has frankly admitted that "no one can foresee the outcome of this super-scheme of federal farm relief." The Act places at the disposal of the farmer prodigious credits, and whether or not it succeeds depends largely on how wisely it is administered.

Tung Oil.—Tung oil is an essential raw material of the present-day varnish manufacturer, and in fact its unique properties render it indispensable for certain types of varnish. Until comparatively recently China has satisfied the world's demand for tung oil, and will, it is considered, continue to remain the chief source for some years to come. The oil is derived from two species of *Aleurites*, *Fordii* and *montana*, of which the former is the chief source. *A. Fordii* has its habitat chiefly in western and central China, whilst *A. montana* is found more to the south. Tung oil, also termed China wood oil, was known outside China about 1760. It was first introduced into the United States in 1896, into Germany in 1897 and soon afterwards into England. Little notice was taken of it commercially in England until after the outbreak of war, when special water-resisting varnishes were required for aeroplane work. Thereafter, on the recommendation of the Raw Material Committee of the Imperial Institute, growing experiments were started in India, Ceylon, Malaya, Burma, Kenya, Tanganyika, Hong-kong and South Africa.

In China the tung oil trees, with reference principally to *A. Fordii*, occur abundantly and grow luxuriantly mostly in a region between latitude 26° and 34° N., and in hilly country up to 2,500 feet in altitude, especially in the upper reaches of the Yangtze Valley. *A. Fordii* favours the northern and *A. montana* the southern parts of the area, but there is no strongly marked division in the distribution of the species. They are ornamental trees and rapid growers, producing fruit, from which the oil is extracted, in and after the third year, though it is safest to calculate on a first crop as from the fifth year. In China the trees generally grow 20 feet to 25 feet in height, with a trunk of about 10 inches in diameter. But individuals are said to attain 50 feet to 60 feet, with a canopy 60 feet in diameter. The trees have a low branching habit, and pruning is necessary to prevent a low straggling cover. The fruit is about the size and appearance of a russet apple and ripens in October. The blossoms are very sensitive to early spring frosts, and young trees, until established, are subject to frost.

A main consideration in the culture appears to be the absence of frost and a sufficient rainfall, which should not be less than 30 inches, but preferably 50 or even 70 inches. The

A. montana species require rather more rainfall than *A. Fordii*. According to Wilson, in China the tree requires a minimum rainfall of 70 cm., and he states that the tree luxuriates at Ichang, where the rainfall averages 75 cm., most of which falls in April, July and August.

Tung oil has been tried on almost every type of soil, and has been found to grow on practically any soil which is slightly acid, with plenty of moisture but still well drained. Apparently the ideal soil is a sandy soil or sandy loam which is underlaid with clay three to eight feet down. This type of soil can be usually drained easily, but remains fairly moist. This does not mean, however, that the tung oil tree cannot and is not being grown successfully on other types of soil. Tung oil trees in Florida have grown on land that ranges from almost pure white sand to heavy clay loam, with excellent growth and yields on all. The observations show that slightly acid soil, well drained but with plenty of moisture, is safe to use for tung oil. Alkaline earth is fatal to the growth of the tree.

Chinese trees yield from one to five bushels of fruit per season according to their age. The kernels form approximately half of the weight of the fruit and contain 58.3 per cent. of oil by analysis, the usual yield in practice being 40 per cent. A tree should yield its maximum crop in the ninth or tenth year, and may be expected to have a useful life of about 30 years.

As has been written, the world was dependent on China for the oil. The United States, the post-war consumption of which went up by leaps and bounds, were the first to realise the position and to take steps to obviate a total reliance on one source of supply and one country. In 1914 the U.S.A. imported 61 per cent. of the total Chinese exports; in 1918, 77 per cent., and in 1925, 80 per cent. The American consumption is now 40,000 tons per annum. The oil is used to a considerable extent for domestic purposes in China, and the increasing world demand will encroach more and more on the stocks required for home use, which will mean that they will only be parted with at an increased price. The methods of collection and extraction of the oil in China are crude and wasteful, yet the crop is regarded as a most profitable one by the Chinese. It was these considerations which led the

Americans very soon after the war to take up the question, added to the fact that they were reluctant to depend for their supplies on a foreign country. They began to study the possibilities of establishing a domestic industry, and with a period of high prices in 1923 brought matters to a head by forming the American Tung Oil Corporation. The object was primarily to demonstrate what could be done with tung oil trees, in the hope, which has been fulfilled, of encouraging farmers to cultivate the tree on a large scale upon a commercial basis. Judged from the manner in which this work is developing over a very wide area in the Southern United States and also in Hawaii and the American Pacific Islands, it has become evident that the farmers have responded to the efforts of the Corporation.

Turning now to the activities in this direction in the British Empire, it is apparent that they fall far short of the American. Prior to 1927 they were almost negligible. The last two years have witnessed a real movement, due to the activities of the Research Association of British Paint Colour and Varnish Manufacturers. Cyprus is experimenting with the seed, and work is being carried out in the West Indies, Palestine, Australia and New Zealand. Reports as to progress are insisted upon from all recipients of seed; so far those received are mostly favourable. As far as Africa is concerned, tung oil plants of the 1927 seed are now being watched everywhere from Kenya to the Cape—in Nyasaland, Tanganyika, the Rhodesias, Transvaal, Natal, Cape Province and in Nigeria.

Experiments in Southern Rhodesia started in 1925, when seed obtained from Kew Gardens was planted at the Mtao Forest Reserve. Some of the seed germinated and a few trees have survived. They have, however, not thriven, and it may be that the conditions at Mtao are not suited to the species. Every year since 1925 small quantities of seed have been received from Kew, and further trials have been made at Mtao, at Stapleford Forest Reserve and at farms situated along the eastern border. In January of the present year, 35 lbs. of seed were received from Kew, and this was distributed to farmers in various parts of Mashonaland where the conditions appear to be suitable for the propagation of the tree. Reports show that in isolated instances the tree has made fair growth, but it is early as yet

to express any definite opinion as to the possibility of establishing it in Southern Rhodesia. The Department of Agriculture hopes to procure a further supply of *Fordii* seed shortly, and this will be distributed to selected farmers in various parts of the Colony, so that further trials can be made.

Farmers' Advertisements.—It does not appear to be known generally that advertisements for insertion in this Journal will be accepted from bona fide farmers wishing to effect sale, purchase or exchange of produce, live stock or farm implements at a specially low tariff, which will be found on the inside back cover. We think much greater use might, with advantage, be made of this facility, and having brought the matter to the notice of readers, trust that such advertisements will be a regular feature of future issues of the Journal.

Leave of Absence.—The Editor of this Journal, Mr. Wm. E. Meade, proceeds on leave for two months on the 27th November. During his absence, Mr. J. A. T. Walters, late Agriculturist of the Department of Agriculture, will act as Editor.

Notes from the Veterinary Laboratory.

By Ll. E. W. Bevan, M.R.C.V.S., Director of Veterinary Research, Southern Rhodesia.

"*Whoever could make two ears of corn or two blades of grass grow upon a spot of ground where only one grew before would deserve better of mankind, and do more essential service to his country than the whole race of politicians put together.*"

Swift.

In these "Notes" Mr. Bevan draws attention to the enormous areas of this country held ransom by the tsetse fly, and discusses the various methods adopted in the attempt to combat this pest. He also explains his own efforts to establish in domestic stock a state of immunity or tolerance against trypanosomiasis, and the principles upon which his process is based.

TRYPANOSOMIASIS.

Immunity.—The local attempts to set up in cattle by artificial means a condition of resistance to trypanosomiasis, comparable to that obtaining in the game in the tsetse fly areas, do not appear to have met with unqualified approval. For example, in the report of the Pan-African and Veterinary Conference, held in Pretoria in August, 1929, we find the following resolution adopted:—"*Immunisation.*—The existence of small herds and flocks in tsetse belts is reported from several countries, and at one time hopes were high that

(In the passages marked *, the italics are mine.—L.E.W.B.)

selective breeding would produce races of domestic animals possessing an immunity tolerance (premunition) towards all species of trypanosomes similar to that possessed by game.

"It would seem, however, that the ability of these small herds and flocks to live in their particular fly belts is due to a limited immunity tolerance towards *local* strains of trypanosomes, and that even this is easily broken down by disease (*e.g.*, rinderpest) or other hardship. We fear, then, that what natural selection, working through a long period with large numbers of animals, has failed to achieve, will not be achieved easily by any method of artificial selection or of active immunisation in the ordinary immunological sense. While, therefore, we do not advocate abandonment of attempts to immunise strains, we do not think that useful results will be as readily attained by such attempts as by expenditure of the same skill and energy on some other line of attack."

(This committee consisted of Mr. Hornby (convener), Mr. Bennett, Col. Turnbull, Prof. Carpano, Mr. Carmichael, Capt. Henderson, Dr. van der Elst and Mr. Jack.)

Or again, in a report appearing in the "Rhodesia Herald" of the International Veterinary Conference recently held in London, at which Southern Rhodesia unfortunately was not represented, we find that Dr. P. J. du Toit, Director of Veterinary Services in South Africa, is reported to have said that "it was doubtful whether any country in the world had more problems facing stock owners than South Africa, which suffered from most European stock diseases, in addition to the majority of the diseases of tropical Africa. It was perhaps fortunate that veterinary science had made such strides in South Africa. A generation ago the veterinary surgeon was judged by his ability to cure an animal. To-day the profession was judged by the measure of its keeping the country free from disease. The work of the veterinary surgeon was formerly individual; now it was national." "The cattle population of Africa was estimated at forty million head, *but this could be doubled if the danger of tsetse infection was removed.** Fortunately, considerable progress in that field had been recorded in recent years. The third line of attack was the immunisation of animals against the

infection. *This, however, had so far not yielded very promising results.*"*

Hornby and Bailey, in the annual report of the work of the Veterinary Pathological Laboratory, Mpwapwa, Tanganyika Territory, for the year ending 31st December, 1928, wrote: "The artificial premunisation of cattle against certain strains of *T. congolense* has been attempted with success by Bevan, in Southern Rhodesia. We fear that his method will not be of much practical value for reasons given above, but we wish him success, and we shall ourselves explore the avenue he has opened."

This adverse and somewhat premature criticism might have proved discouraging had not previous experience "premunised" the writer against it. It was not allowed to deter the work, which was continued as enthusiastically as limited time and facilities and a multiplicity of other problems requiring attention permitted. It is pleasing also to find that Mr. Hornby, the convener of the Trypanosomiasis Committee, which at the Pan-African Conference "did not think that useful results would be as readily attained by such attempts as by expenditure of the same skill and energy on some other line of attack," proceeded to Onderstepoort to explore the same avenues. The results of his researches, which are published in the sixteenth report of the Director of Veterinary Services, Union of South Africa, for the year 1930, appear to indicate that he did not find the idea as futile as the committee suggested. His report will be dealt with later.

It may be as well to explain why, in spite of the efforts of so many distinguished scientists in other directions, it was decided to endeavour to find a method of protecting domestic stock against trypanosomiasis. In the first place, it was recognised that vast areas, including some of the richest agricultural and most highly mineralised parts of Southern Rhodesia, were held ransom by the tsetse fly. Mr. Jack, the great authority on this subject, in a paper entitled "Some aspects of the tsetse fly problem in a Colony developing on the basis of European settlement," read before the veterinary section of the Pan-African Agricultural and Veterinary Conference previously referred to, states:—

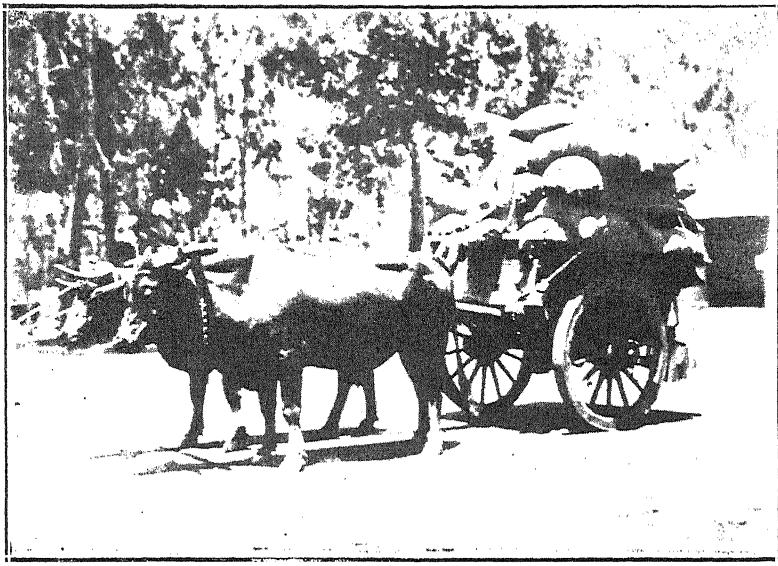


Fig. 1.

Trypanosomiasis inoculation. "Premunised oxen." These oxen were artificially infected and treated, and have been frequently re-infected. They are now in excellent condition and regularly worked.

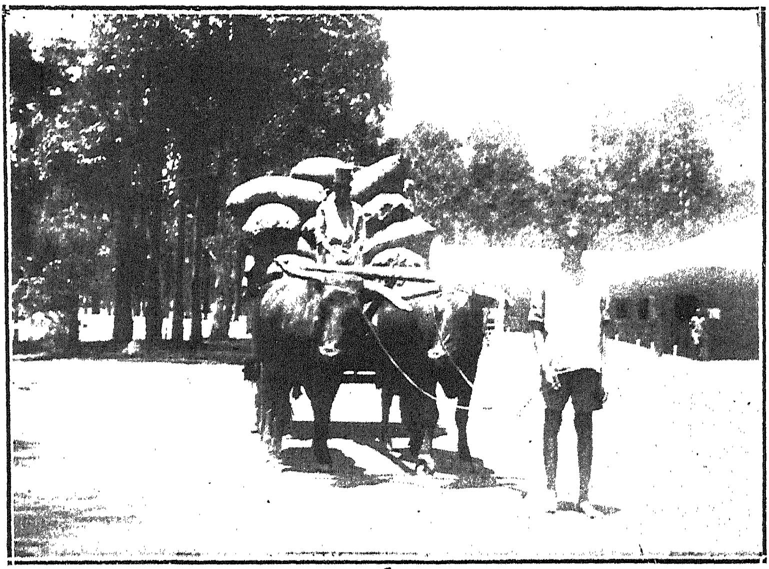


Fig. 2.

Trypanosomiasis inoculation. "Premunised oxen." The same as in Fig. 1.

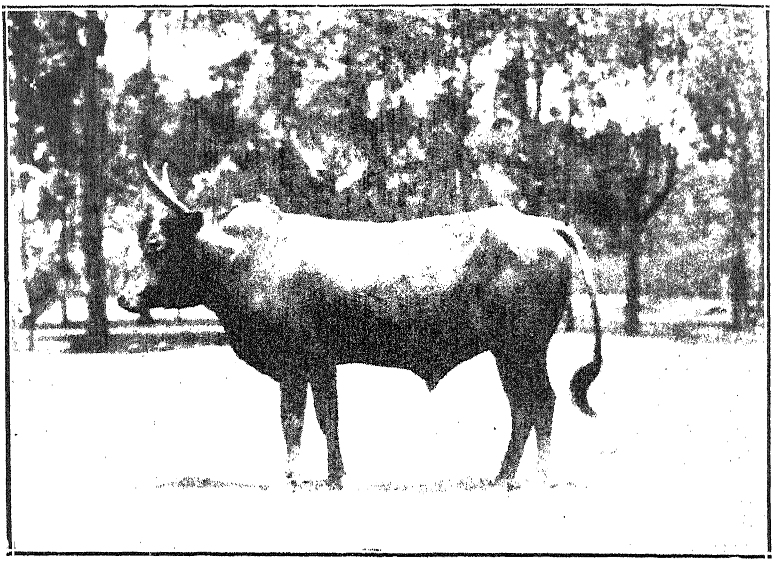


Fig. 3.
Trypanosomiasis inoculation. Naturally infected, treated ox.

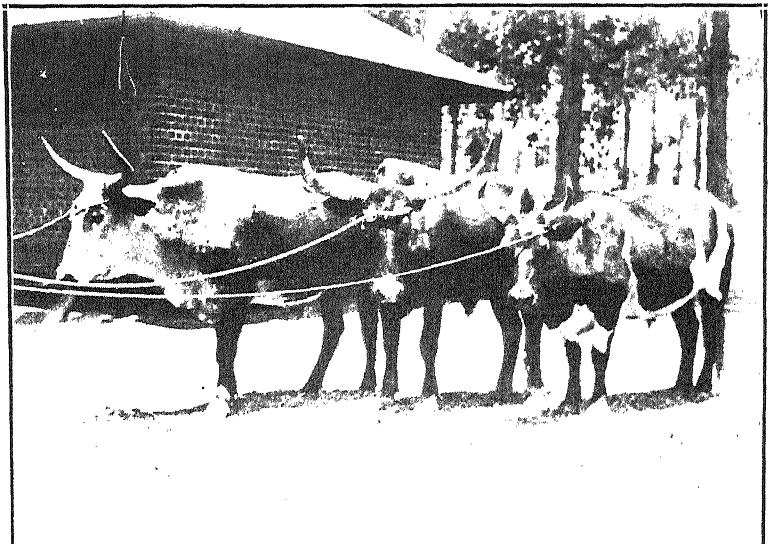


Fig. 4.
Trypanosomiasis inoculation. Naturally infected, treated oxen. The animals shown in Figs. 3 and 4 are the survivors of a span of oxen naturally infected in the Hartley district. They arrived at the laboratory in a dying condition and were successfully treated. They have been frequently re-infected, but are always in the excellent condition shown in the illustrations.

"Approximately half the area of the Colony was infested with tsetse during the past century, the infested country being divided into two areas by the elevated high veld which traverses the Colony roughly in a north-east and south-west direction. Tsetse disappeared from the southern area following the year 1896, and in the north shrank to comparatively small belts in the Sebungwe, Hartley and Lomagundi districts. The southern area as far as is known has not yet been re-invaded, though in apparent danger of eventual re-invasion from Portuguese East Africa. The fly has, however, been spreading steadily in the northern area during the past thirty years, and now occupies fully 18,000 square miles of country. Ten years ago the infested area was estimated at 9,000 square miles. Twenty years ago it is doubtful if 4,000 square miles were involved. The separate areas have now coalesced to form a vast fly area extending across the northern part of the Colony from the Darwin district in the north-east to the Wankie district in the west. The tendency of the fly is to continue to spread on a front which, following its convolutions, exceeds 600 miles in length.

"The presumably climatically protected high veld is now almost all occupied or alienated, and much settlement has taken place in potential fly country known to have been infested in the past. Land available for new settlers, whom the Colony so greatly needs, is now almost confined to the potential fly country.

"Encroachment of fly and extension of settlement have resulted in contact being established in more than one district, with consequent loss of stock and actual or threatened evacuation of farms.

"Loss of stock owned by natives has also occurred in various districts, and certain native reserves have been invaded or are threatened with invasion by the fly.

"From the practical standpoint, the problem therefore includes the following features:—

(1) Saving from evacuation certain areas in European occupation affected by the fly.

(2) Prevention of invasion of native reserves and other areas of native occupation.

(3) Arrest of the general spread of the pest.

(4) Reclamation of infested area.

"It may be said that the solution of the problem in all four of the above-mentioned aspects is in the long view vital to the health and development of the Colony. There is, however, this to be considered—namely, that scarcely a generation has passed since the fly evacuated the major portion of the potential fly area, and that consequently the natives inhabiting this area are accustomed to living without cattle and do not in general desire to leave their home areas when this is re-invaded by the fly. The European settler, on the other hand, in spite of the possibilities of tractors, etc., can hardly at present maintain his position on an economic basis in the presence of the fly, and in point of fact would not attempt to do so, except in prospect of a not too distant improvement in the position."

If Mr. Jack's estimate is even approximately correct, it would appear that some 18,000 square miles or 11½ million acres are rendered precarious for settlement and development by the tsetse fly. But if, as some maintain, trypanosomiasis can be transmitted by blood-sucking flies other than the tsetse, then the area involved is immeasurably greater. The stake at issue even in this country is enormous, but in other parts of the British Empire it is far greater. It therefore appeared desirable to make some effort, no matter how humble or unorthodox, to ameliorate this state of affairs, and the line of research undertaken, based as it was upon a foundation of practical experience and promising preliminary experiments, appeared to offer a reasonable prospect of success.

Mr. Jack, in a recent issue of this Journal, writes: "It is obvious that discovery of methods of protecting domestic animals from infection by suitable treatment, or of effecting a speedy and reliable cure of the disease, would greatly modify the problem as it confronts the entomologists to-day. The necessity for research into the problem from all standpoints is therefore clearly apparent. Success in fighting trypanosomiasis in domestic stock in one way or another is vital to the healthy development of the Colony. It is unquestionably one of the most pressing problems with which the Colony is confronted at the present time." On the other hand, in his address to the Pan-African Conference, Mr. Jack says, concerning the limitation of settlement as a barrier

against the fly's advance or as a means of reclaiming infected country, "It is the protection of agricultural settlement which constitutes the most urgent aspect of the problem in Southern Rhodesia to-day. Suggestions as to utilising it as a spearhead of a thrust or as a barrier to the advance of the fly appear about as logical as the suggestion that helpless women and children should be employed in a similar way against the enemy in war." One may venture to suggest, however, that if settlers could protect their animals against trypanosomiasis their position would be less tragic. If farmers, miners and transport riders could take their cattle with impunity into the fly areas, it is possible that as the result of their activities, by the cutting down of the shelter necessary for the propagation of the tsetse and by generally disturbing the "balance of nature" to the disadvantage of the fly—Mr. Jack has stated that "*the tsetse is very delicately poised in the balance of nature*"*—the fly might eventually be evicted.

Alternative Methods.—In Mr. Jack's address to the Pan-African Conference he discusses the various methods adopted in the campaign against the fly. He says "practical operations against *morsitans* and other species of Glossina favouring savannah forest appear, in the light of present knowledge, to be confined to a very few alternatives. Amongst these may be mentioned (1) organised grass fires, (2) solid clearance of forest, (3) destruction of essential retreats and (4) game reduction."

It would be impossible in the space at our command to reproduce all that Mr. Jack says under each of these headings. We must content ourselves with some of his more important conclusions. With regard to (1) *Organised grass fires*, he says: "It may be stated briefly that much of the country involved in Rhodesia does not appear to lend itself to successful employment of this measure, and that experiments conducted have given discouraging results." Also to "rely upon putting this measure into practice year after year, unless a very elaborate and expensive guard system were maintained, *would be gamble against odds.*"*

Next, with regard to (2) *Solid clearance of forest*, we read, "complete clearing as a means of re-claiming infested country appears *out of the question** in reference to any

aspect of the problem at present apparent in Southern Rhodesia, and in any case generally undesirable." And later, "Attempts to create barriers of the nature suggested appear almost *a measure of desperation*.* Such barriers are inelastic, and the prospect of the interminable maintenance and patrol involved in their effective employment is not short of appalling."

Concerning (3) *Destruction of essential retreats*, Mr. Jack explains, "Under this heading is included clearance of forest which remains ever-green during the latter part of the dry season. This measure is clearly not everywhere applicable, but in certain regions of comparatively low rainfall and shallow soil and where mopani forest is the dominant savannah type, it may be possible to carry it out *at a cost which stops short of being prohibitive*.* The practicability of rendering country altogether uninhabitable by *morsitans* by this measure has, however, *yet to be proved*."*

Mr. Jack deals with (4) *Game reduction* at some length, and those interested should read the original, where they will find that "intensive operations in limited areas appear to afford the best prospect of success, and in Southern Rhodesia the measure is being tried out in various districts and under varying conditions. With a view to protection of European settlement, game fences are being employed on an extensive scale, whilst operations without fences are proceeding in native reserves and in other localities. Indications to date are that it is practicable to check the fly and cause some retrogression by the measure, but no claim can be made that it affords a fully satisfactory solution of the problem. It has in fact been necessary to resort to it in the *apparent absence of practicable alternatives*."*

Some years ago operations were undertaken with a view to the destruction of game. Mr. Jack tells us that "sentiment counts for much in human affairs, and there is hardly any need to state that to any naturalist and lover of wild life large scale destruction of the natural fauna is extremely abhorrent." But apart from this objection, it is open to doubt whether it will achieve the object in view, namely the elimination of the fly. Elsewhere he says, "A feasible explanation of the dependence of *G. morsitans* on the larger Ungulata seems to be that a regular supply of blood is

essential to the continuance of the fly, and that this is only afforded by the presence during the greater part of the year of these grass-feeding animals. An irregular supply is afforded by monkeys, baboons, small buck and other animals, and possibly birds, which may help to tide the insect over periods of scarcity." It has been suggested that in the absence of game, the tsetse fly might even obtain nourishment from the settler and his stock, which would be most unfortunate. It has also been urged that as the result of these operations the game is driven from its usual haunts, and thus reservoirs of infection are widely disseminated. There are settlers who attribute infection of their cattle to driven animals finding sanctuary upon their farms and bringing fly with them. The "following" habits of the tsetse are well known, and since these insects require a feed of blood every few days, and many of them can infect when feeding, a single infective fly compelled to subsist upon domestic stock may do considerable damage. Also, if, as some suppose, the disease can be transmitted from "carriers" of infection by blood-sucking flies other than the tsetse, the danger is all the greater. Indeed, if "mechanical transmission" does commonly occur, the position is seriously complicated, and the entomologists will have to eliminate not only the tsetse, the game and all other possible "carriers," including recovered cattle, but also the biting flies. In such circumstances, fencing and similar measures will be of little avail.

Mr. Jack also refers to the control of traffic. He says "increased use of motor vehicles for prospecting and hunting purposes has rendered control of such traffic highly desirable in some localities, and during the last session of the Legislative Assembly at Salisbury an Act was passed giving the Government powers in this connection. This Act is to be utilised at once."

Reference must be made here to methods of trapping the fly, which have recently attracted attention in the local press. Highly successful results have been claimed for these traps, of which, however, enormous numbers will be necessary to bring about any appreciable reduction in the fly, which in Southern Rhodesia alone "now occupies fully 18,000 square miles of country."

Research.—Thus, we see, the entomologists cannot at present offer any immediate solution of this problem. In time, no doubt, they will succeed, but until then it would appear desirable that workers in other branches of science should contribute. It is pleasing therefore to read the final paragraphs of Mr. Jack's address, in which he expresses the opinion that "it appears highly desirable that a more or less permanent field station should be established in an undisturbed fly area, where pure bionomical research can be made the main feature of the work, whilst facilities for experimental and *ad hoc* research also exist in the neighbourhood. An increase in the technical establishment would, of course, be involved, *and collaboration between veterinary officers, protozoologists, entomologists, etc., is indicated.*"*

It is interesting to note that at a tsetse fly conference held at the Veterinary Laboratory on the 14th April, 1925, a resolution was submitted advocating a research station to be set up in a suitable locality in the vicinity of the fly area, where a staff of whole-time experts could study the question of trypanosomiasis on the spot, with a view to the ultimate taking of measures based upon exact scientific knowledge. It is satisfactory therefore to learn from Mr. Jack that "the question of establishing a suitable research station in the fly country is receiving the very serious consideration of my Government at the present time."

Since the conference above referred to, the Veterinary Research Department has not been included in what may be called the major operations against the fly. But being officially responsible for research into animal diseases in this country, of which trypanosomiasis is undoubtedly one of the most important, it was felt incumbent upon it to make some effort, and it was decided to concentrate on certain ideas based upon practical experience of the disease with a view to rendering domestic stock resistant to infection.

Practical Observations.—It has long been known that game in fly areas can carry trypanosomes in their blood and yet remain unharmed by them. In other words, they enjoy an "immunity tolerance" against them. That they are so infected can be shown by injecting their blood into susceptible animals which develop a fatal form of trypanosomiasis. How this immunity was brought about was unknown, but appeared to be worthy of investigation.

The following passage from the report of the Acting Director of Veterinary Services of the Uganda Protectorate for the year 1929 indicates that cattle, also, under natural conditions can become tolerant to trypanosomiasis and remain healthy until infected with some other disease. It says:—"Evidence is accumulating that all species of trypanosomiasis in cattle can assume a chronic form, *which has little harmful effect on the host** and might remain undetected except when some other disease such as rinderpest brings the trypanosome infection into evidence. . . . It was possible to keep one dairy herd, which contracted *T. vivax* infection in Kampala, under observation. Out of 30 adult animals, 22 definitely showed blood infection. *One death took place*,* which was doubtfully ascribed to trypanosomiasis. There appeared to be no real diminution in the milk yield from the herd. . . . In some countries it has been claimed that breeds of cattle exist immune to trypanosomiasis. No evidence of such breed immunity has been found in Uganda, and the tolerance exhibited in some areas appears more probably due to what is commonly a virulent trypanosome assuming a non-pathogenic type."

It has also been observed on innumerable occasions during the past twenty years, during which the antimony treatment of cattle has been practised in this country, that certain animals recovering as the result of treatment, having regained their health, can return to the fly area and apparently resist re-infection. They too, like the game, appear to become "tolerant."

These practical observations appeared to be worth following up, and it was decided to endeavour to improve the method of treatment, with a view to setting up deliberately this state of tolerance which, under the conditions of treatment as practised in the field, was brought about haphazard. Under natural conditions the time and degree of infection and the response of the particular parasite to the antimony treatment are more or less unknown factors. Further, it is not known exactly how the drug produces its beneficial effect, whether by sterilising the animal of the parasite or by breaking up the trypanosome, thus enabling the host to generate anti-bodies against its toxins; and again the best method of applying the treatment has not been determined. Some advocate massive doses, others small ones; some re-

commend daily doses, others advise treatment at intervals of three, five or seven days, and others consider it sufficient to apply it less frequently. Hornby has written a thesis on the dire effects of antimony treatment—others with long experience have not encountered them. Antimony, however, is a poison and should be used scientifically. Frequently it is prescribed by laymen and is used promiscuously to cure any disease which resembles trypanosomiasis. As applied by some it is "as dangerous as a loaded gun in the hands of a monkey." As the originator of the treatment in this country in 1909, the writer recognised that it was necessary to improve the method in order that regular results could be depended upon, and that experiments were also necessary to establish a standard strain of trypanosome having a more or less defined period of incubation, a known period when the greatest number of trypanosomes would be present in the peripheral blood, and yielding a definite reaction to antimony treatment. It was sought to regulate the whole procedure of infection and treatment and to set up systematically that tolerance which occasionally follows the treatment of infection in the field.

Hornby in his recent report records "some observations which, while exposing the weak points of the existing schemes of immunisation, may yet contribute towards their ultimate successful development." He found that when his animals "were kept under very good conditions as regards stabling, food and general attention . . . the untreated disease almost invariably ran a chronic course." But such conditions can only rarely be secured under field conditions. He found that it was not necessary to "time" the injections of antimony, as advocated by the writer, but that he could obtain premunition without any particular consideration of the time of the appearance of the trypanosomes in the blood. In the exceptional conditions under which he was working this might have been possible, but in the circumstances obtaining in this country, the "timing" method is to be preferred. In fact, animals inoculated with our virus die unless properly treated. He admits, however, in his summary that "the administration of a trypanocidal drug often changes the chronic state to one of premunition. By this means it is not difficult to premunise a bovine against a single strain of *T. congolense*. Bovines premunised against a par-

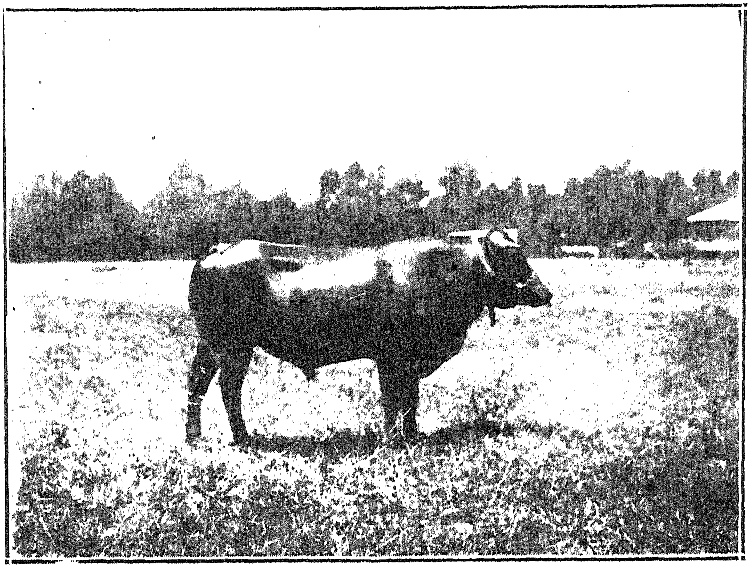


Fig. 5.
Trypanosomiasis inoculation. Inoculated ox at the termination of treatment.

Fig. 6.
Trypanosomiasis. The one ox, inoculated and treated, works regularly, in the presence of blood-sucking flies other than the tsetse, with the second ox, which remains healthy.

ticular strain of *T. congolense* are unaffected by re-inoculation with the same strain. Bovines premunised against one strain of *T. congolense* are practically as susceptible to inoculation with a different strain as bovines not so premunised." But later he says: "Bovines premunised against a particular strain and then inoculated with a different strain do not show, as reflected by the red cell count, such a progressive anæmia as bovines not so premunised. This point in favour of the premunised bovine might be a factor, under natural, especially favourable, conditions, which might enable a greater proportion of bovines to become premunised against a second strain of *T. congolense*." Mr. Hornby's conclusions appear to be somewhat contradictory.

Strains.—The difficulties associated with varying strains had been foreseen, and in a paper by the writer contributed to the "Transactions of the Royal Society of Tropical Medicine and Hygiene," August, 1928, he said: "It is not claimed that the above method . . . will solve all our difficulties in connection with bovine trypanosomiasis, a subject which is bristling with complications. For example, it is by no means certain that it is applicable to types of infection other than those caused by *T. congolense*, or even to all strains of *T. congolense* infection." Since then, however, experiments have been carried out with a view to overcoming this difficulty, and it is believed that by a simple elaboration of the process described in the above paper this can be done.

A similar process has been evolved and applied for many years to protect cattle against redwater and gall-sickness. The Union of South Africa virus was found not to afford complete protection against all strains of Rhodesian infection, and a method embodying local strains had to be elaborated. Similarly, the fact that the immunity against one strain of horse-sickness virus may not protect against another, seriously complicated the methods of inoculation against that disease, but was successfully overcome here, the local method having proved protective against most Rhodesian strains of infection. As far as trypanosomiasis is concerned, all that we need in this country is to protect our cattle against the common Rhodesian strains, and there is reason to believe that if time and facilities are provided for the continuance of the present line of research, this may yet be achieved.

Soil Erosion Prevention in Nyasaland.

By P. H. Haviland, B.Sc. (Eng.), A.M.I.C.E.

A twelve days' visit to Nyasaland to advise planters as to suitable methods of combatting soil erosion proved very interesting, and the writer's only regret was that the time spent in this progressive Protectorate was too short to permit of his visiting as many estates as he would like to have seen.

For some years the problems connected with the washing of the cultivated lands have received practical attention at the hands of the Government officials and planters, and Nyasaland is to be congratulated on the amount of anti-soil erosion works in existence at the present time.

The writer had the opportunity of visiting a number of representative tea, coffee, tobacco and cotton estates, and the various problems encountered at each were of intense interest.

At the present time, about 75 per cent. of the total number of tea estates have been either partially or wholly protected against soil washing, and the results have undoubtedly proved the expenditure economical. The tobacco and cotton estates are somewhat behind the tea estates, but steps are being taken now to deal with the menace on these lands.

The reason for the rapid and thorough work done in the tea areas is due to the steep slopes on which this crop is generally grown. Tobacco and cotton are being produced generally on much flatter slopes, and it is only comparatively recently that the ravages of erosion have been recognised and are now being dealt with.

The writer was able to point out to various individual planters how the first results of soil erosion could be recognised on their lands, and feels safe in predicting that within a comparatively few years 90 per cent. of the European-owned cultivated lands of Nyasaland will be protected.

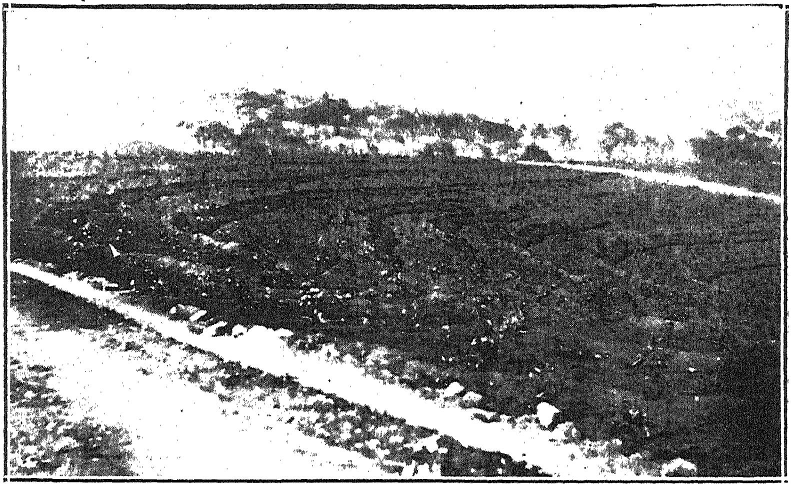


Fig. 1.
Ridge terracing on moderately steep sloping tea garden, with drains below ridges. Limbuli Estate (Blantyre and East Africa, Ltd.).

Fig. 2.
Ridge terracing on Likanga tea gardens (Ruo Estates), showing progress in formation of level terraces. The present surface above the ridge is about 2 feet higher than the original ground surface.

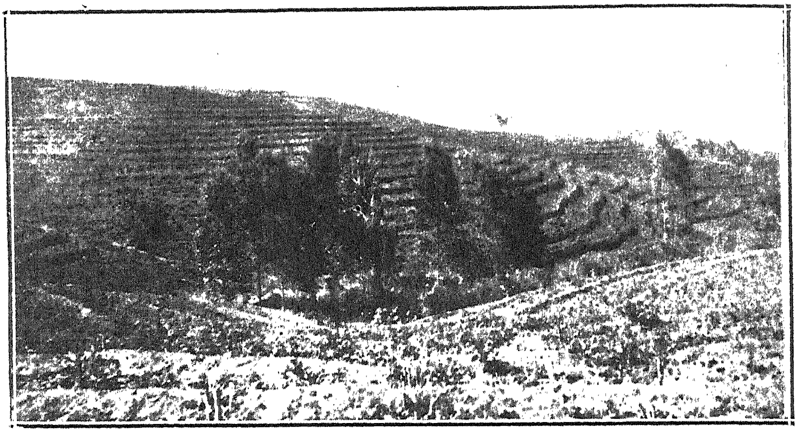


Fig. 3.
Ridge terracing on steep tea garden lands on Zoa Estate (Blantyre and East Africa, Ltd.).

Fig. 4.
Typical unprotected tobacco and cotton land in Nyasaland. Light coloured streaks are due to erosion in the form of gulleying. This land is to be ridge terraced this year.

To describe the visit in detail would occupy too much space, and a few general remarks will have to suffice.

The rainfall varies considerably in different parts, from 75 inches per annum in the Mlanje area to about 30 inches per annum in the lower Shiré valley. Soil and climatic conditions in parts are very similar to conditions in this Colony, and the vegetation types are identical. The rainfall, although generally greater in amount than the Southern Rhodesian rainfall, appears to have no very much heavier intensities than are encountered here. Consequently the problems connected with soil erosion are very similar. The soil conditions in the Mlanje wet belt, however, are different from conditions in this Colony. The typical Mlanje wet belt soil is very friable and porous and of a lateritic nature. The pore space is in the neighbourhood of 60 per cent., resulting in rapid percolation.

On the tea estates in the Mlanje area, ridge terracing (contour ridging) has been adopted, with the ridges set level (not on grade), and this system has operated very well. In the opinion of the writer, however, had the ridges been set on a grade of 1 in 400 or 1 in 500, still more efficient results would have been obtained.

In this area, immediately below each ridge, a drain has been excavated some 12 inches to 18 inches deep and about 9 inches to 12 inches wide. Silt washed off the down-stream face of the ridges collects in these drains, and is removed annually to aid in building up the ridges again. Another function of the drain is to draw off water collected above each ridge, the water percolating through the friable soils.

With ridge terraces without grade, it is undoubtedly necessary to draw off the accumulated water, and in such exceptionally porous soil as that encountered at Mlanje, the drain below unquestionably helps.

It has been the practice in the past on some estates to make the drains without outlets, but this idea is gradually being discarded, and the drains, or a number of them, are opened at the ends to discharge the storm water.

The Chola area has adopted a similar system of drains below the ridges, but this the writer considers to be unneces-

sary, as the soil texture is of a closer nature and percolation of water through the soil would be too slow.

The descriptions of the illustrations are as follows:—

1. Ridge terracing on moderately steeply sloping tea garden on the Limbuli Tea Estate (Blantyre and East Africa, Ltd.). The ridges are level, and the drains below the ridges can be seen. It will be noted that final terracing of the land is well on the way to completion.

The vertical interval between the ridges is about 2 feet 6 inches and the slope of the land about 1 in 10. The estate is situated at the foot of Mlanje mountain.

2. This illustration shows progress in the formation of terraces on the Likanga Tea Estate (Ruo Estates). The present surface above the ridge is 2 feet to 2 feet 6 inches higher than the original ground surface. The ridges were originally about 12 inches in height, with a vertical interval between successive ridges of 3 feet. Final terracing is almost complete and the erosion very considerably reduced.

This estate is in the Mlanje area. The figure in the background is Capt. A. J. W. Hornby, M.B.E., B.Sc., A.I.C., the Government Agricultural Chemist, and the figure in front is Mr. Snell, the estate manager.

3. Ridge terracing on steep hill sides is here illustrated, the estate being Zoa Tea Estate (Blantyre and East Africa, Ltd.). The work done here is very nearly ideal. The ridges are on grade and discharge into shallow drains of bricks laid dry (without mortar).

A drain may be seen in the background as a light streak running down from the right top of the hill.

Terracing, it will be seen, is proceeding apace. No tea was planted on any portion of this estate before the land had been ridge terraced.

4. This is typical unprotected tobacco and cotton land in the Ncheu area. The light coloured streaks are due to erosion in the form of gulleying. Ridge terracing is to be carried out on this land.

The soil, a light loam, is similar to soils in many parts of Southern Rhodesia, where the average rainfall is in the neighbourhood of 30 to 35 inches.

The Objects of Ripening Cream for Butter-Making

AND A FEW HINTS ON CREAM PRODUCTION.

By F. Lammas, Dairy Officer.

The process of ripening cream is achieved by the development of those micro-organisms in the cream which we know from experience are capable of imparting to the resulting butter a desirable flavour and aroma. These latter are developed by the decomposition of certain of the cream constituents and by the production of bye-products (chiefly lactic acid) which are essential in the process of churning.

Cream ripening thus depends upon the care and treatment the cream has received from the time of separation until it is churned. Long before the science of bacteriology was understood and applied to industry, it was noted that certain districts in Europe produced butter and cheese of outstanding quality, and at first this was put down to the different qualities of pastures. It was, however, discovered that by using butter-milk and whey from these districts with which to ripen cream and milk derived from other districts, prior to its manufacture into butter and cheese, the same results could be obtained.

The improvement was not attributed to living organisms, as it was thought that chemical agencies were responsible for the desired flavour. Early bacteriologists soon proved that these characteristic flavours and aromas were due to living organisms, and they proceeded to isolate them, growing them on pure cultures, using them to inoculate milk and cream. In the early days the results were not very encouraging, as the art of butter-making was imperfectly understood, and flavours and aromas were the sole goals aimed at.

The bacillus first isolated (*Bacterium lactic aerogenes*) was capable of imparting to the butter high flavours and aromas, but it also produced gas, which is a serious defect in both butter and cheese, especially if the latter are kept in storage for any time or exposed to high temperatures. However, these troubles did not stop the use of these cultures or "starters," and a field of investigation was opened which resulted in the desired organism being ultimately isolated. This was the *Bacterium lactis acidi*, which is not capable of developing the same amount of flavour and aroma as the first organism isolated, but which assists in this respect with no apparent ill effect.

It should be clearly understood that flavours and aromas are very largely due to pastures, bacteria only assisting to bring out these qualities.

What happened in the early days, when butter-milk and whey were borrowed from neighbouring districts, was simply due to the inoculation of the desired organisms into the cream and milk in which undesirable organisms might have predominated, and this resulted in the desirable organisms overcoming the action of the undesirable. In consequence of this a sound article was produced.

Experience has taught us that ripened or sour cream churns much more easily than does sweet cream, with much less labour and less loss of fat in the butter-milk.

The ripening process, with its consequent formation of lactic acid, tends to make the cream less viscous by the action of the lactic acid on the casein, which breaks down each particle into yet smaller particles, automatically changing the mechanical condition of the cream into a granular body. This liberates the fat globules, so that in the process of churning they readily coalesce as the result of friction and concussion. These organisms, under favourable conditions, cause the production of clean flavours and aromas, and of a better keeping quality butter. This has been proved by churning two lots of the same cream, one of which has been inoculated and ripened with a pure starter, the other allowed to ripen in the natural way.

That the process of ripening cream has an effect on the keeping quality of the butter is beyond all doubt. As already stated, the development of excessive numbers of lactic acid

bacteria produces decomposition, and this is contrary to the development of good keeping qualities. For butter or cream to keep any length of time, very little change or decomposition should take place, and when it is borne in mind that the decomposition continues after churning, it will readily be seen that the higher the flavours and aromas immediately after churning, the shorter will be the period for which butter can be kept. Butter then made from perfectly sweet cream has good keeping qualities, provided, of course, that the cream has been handled carefully, and that no undesirable organisms are present.

The churning of sweet cream results, however, in much extra labour, prolonged churning and loss of fat in the butter-milk, and is apt to produce a butter of a flavour which the public does not demand. Such butter would be ideal for storage purposes, for flavour and aroma would develop after churning, but the great disadvantage, however, is that we have no simple test to detect what organisms are present in the cream, and consequently we find that in many cases the results are very disappointing.

The artificial ripening of cream, or the use of starters with which to ripen cream, is probably not practicable on the majority of farms when butter-making is only done twice weekly, for the starter requires to be attended to each day, and for the amount of cream handled, the extra labour is not warranted.

Natural Ripening of Cream.—This is the oldest method of cream ripening known. In the early history of butter-making the cream was allowed to sour slightly, simply because it assisted in the churning and not because flavours and aromas were improved. This method simply consists of allowing the cream to stand in a clean atmosphere at a favourable temperature for bacterial growth and causing it to sour in the natural way. The character of the fermentation in the cream and the quality of the resulting butter will depend largely on the types of bacteria present when the cream leaves the separator and also upon the treatment the cream receives during the ripening process. The development of the bacteria present will also depend upon the treatment the milk receives, for bacteria are always present in the cream during the process of separation.

Cream ripening then actually starts at milking time. Milk produced under clean and sanitary conditions will contain fewer organisms than milk produced under unsanitary conditions, and it is possible to state that when milk is produced under clean conditions the bacteria present are more likely to be of the desirable type. When cream is produced under highly sanitary conditions, natural ripening may result in the production of a very sound quality butter. When, however, little attention is given to cleanliness, the bacteria present are most likely to be undesirable types over which the butter-maker has no control, and these cause fermentations which are harmful to the production of a fine quality butter, tending to the formation of gas and consequent difficult churning.

The objection to this system of cream ripening is the lack of uniformity in the resulting butter, for not only do the varieties of bacteria vary with the treatment the cream receives, but also during the various seasons of the year. Thus we find during the summer months, when plenty of green grass is available, that conditions seem to favour the growth of the lactic acid bacteria, resulting in the predominance of this type and in the general absence of those types which are harmful to flavour and aroma; and we also find that during these months, if we eliminate the difficulties of churning due to high temperatures, little effort is required in obtaining a delicately flavoured butter.

During winter and early spring, however, the position is reversed; conditions seem to favour the predominance of bacteria of the *aerogenes* type (those producing gas), and we find especially during winter that some difficulty is experienced in ripening cream sufficiently for churning, and that after prolonged churning the butter is flat or insipid, and moreover has little keeping quality.

Cream Ripening during the Winter Months.—Bacteria thrive best when temperature and food supply are suitable for growth. The more liquid the food supply is, the faster will be their growth and reproduction; thus cream, which is really concentrated milk, affords less favourable conditions for the development of bacteria than does fresh milk. It has been the experience of many butter-makers that churning in the winter months is tedious work, and that it requires

sometimes as long as two hours before the butter grains are formed. This in most instances is due to the cream not being sufficiently ripe to assist in the ease of churning, the lactic acid bacteria being held in check by low temperatures and by the fact that the cream is generally too thick. In winter the separation of a thin cream of about 32 per cent. to 35 per cent. consistency for butter-making purposes will give good results. This affords ample liquid food supply for bacteria.

Temperature.—Bacteria behave differently at different temperatures. The desirable lactic acid type thrive best at temperatures ranging from 70 degrees F. to 80 degrees F.; at higher temperatures (180 degrees F. to 200 degrees F.) they are destroyed. At freezing point they do not multiply at all, but when the temperature is raised above freezing point they commence to increase, and their rate of increase varies according to the temperature until "optimum" temperature is reached.

It has been shown that the desirable temperature for the growth of the lactic acid bacteria is between 70 degrees F. and 80 degrees F. Seventy degrees F. is therefore advisable for winter ripening of cream, for although at 80 degrees the lactic acid bacteria multiply more rapidly, it has been found that organisms producing gas also multiply very rapidly at this temperature.

Summer Cream Ripening.—Even under the most hygienic conditions, when bacteria are excluded as far as possible from the milk and cream, no difficulty is experienced in obtaining development of acidity during summer months; the difficulty on the majority of farms appears to be the absence of some method of retarding the development. Under summer conditions it is advisable that the milk be separated immediately after milking and that the cream be cooled down directly after separation to as low a temperature as is possible.

This effect may best be obtained (in the absence of a proper cooler) by standing the cream in a pail of water covered only with a muslin cloth, the sides of the cream container covered with a wet bag or blanket, with the ends hanging into the water. If the cream is then allowed to stand in a cool place (preferably by an open window) and

stirred regularly, little difficulty will be experienced in cooling.

Bacteria when present in cream and under favourable conditions of temperature, etc., multiply at a most alarming rate, and if their growth is not checked by sufficient cooling after the cream is separated, undesirable fermentations or over development of lactic acid will be the result. It has been estimated that the rapid cooling of cream decreases the reproduction of bacteria by over 400 per cent. as compared with cream allowed to cool in the natural manner. Again the point is stressed, that when it is sought to control bacterial action, the cream must be cooled immediately after separation, and if the cream is maintained at churning temperature for twelve hours before churning, no difficulty due to lack of acidity should be experienced.

Thickness of Cream.—As previously mentioned, bacteria are not only dependent upon temperature, but also on food supply and the form in which this is available. Thick cream affords less food than does thin cream, and as it is the farmer's aim to reduce bacterial activity to a minimum, a thick cream is advocated. Cream of 45 per cent. to 50 per cent. consistency gives the most satisfactory results during summer months.

It is advisable when churning is done on the farm that in summer time this should be done every third day, and during winter months, when the souring of cream is difficult, every fourth or fifth day. The practice of holding cream over more than five days in the winter is not advisable, for more often than not a stale flavoured butter will result.

It is generally agreed that fully 90 per cent. of the second- and third-grade cream produced in this Colony has been affected by bacterial action. These may be desirable as well as undesirable types. The remaining 10 per cent. is due probably to food taints or due to the fact that cream is allowed to stand near articles liable to impart foreign flavours.

Too much emphasis cannot be placed on producing milk under the most hygienic conditions, as whatever bacteria are then present will in all probability be of the desirable type and their numbers so few that their control by prompt reduction of temperature after separation will not be a difficult problem.

Taints due to feeds such as silage, turnips, wild garlic, etc., are not of very common occurrence, and when one is compelled to give feeds liable to taint the milk and cream supply, the feeding should be done after and not during milking time.

Not infrequently cream is tainted by such articles as fruit, vegetables, meat, etc. This is lamentable, for by exercising a little care a defect of this nature should never occur. Milk and cream have the power at all temperatures of absorbing and retaining such taints when kept in close contact with articles of this nature. It is therefore obvious that the dairy should be used only for storing and ripening cream.

Utensils.—Too often it is noticed that farmers use paraffin and petrol tins for the purpose of storing cream; this practice is not to be recommended, for the tinning of these tins is of the lightest and they actually impart a flavour to the cream.

The milk bucket should be of the seamless heavy tinned variety, being sanitary in every respect. Being seamless, there are no joints in which bacteria may find lodgment. On the other hand, owing to the difficulty involved in the cleaning of buckets of the jointed variety, the milk remaining in the seams coagulates and provides suitable food for bacteria.

The open type milk pail used on most farms to-day seems to have been designed to catch all the dirt possible. A pail 12 inches in diameter has a dirt-catching area of 113 square inches, whereas one with half the opening has only about one quarter the exposed area.

The quality of the cream and the resultant butter depends greatly upon the method of milk production, and in this respect it is urged that the article entitled "Production of Clean Milk," which appeared in the *Rhodesia Agricultural Journal* of August, 1926, and reprinted as Bulletin No. 606, be carefully perused.

Separator.—If a separator is taken apart after 20 or 30 gallons have been run through it, it will be found that a great deal of dirt and slime has collected on the outer wall of the bowl and also quite a considerable amount between the discs. In addition to the slime, the bowl contains quite

an appreciable amount of milk, cream and skim-milk, all of which, if not promptly removed, are liable to set up fermentations. If not washed after each separation, the separator bowl becomes a source of contamination and results in inferior quality cream and butter—a state of affairs that no treatment of the cream can overcome.

After separation has been completed, and while the machine is still running, flush out the bowl thoroughly with clean, lukewarm water, until the water running from the cream and skim-milk spouts is fairly clean. Flushing the bowl in this manner removes most of the cream and skim-milk and loosens the separator slime and makes subsequent washing easy. The bowl should then be taken apart and scrubbed thoroughly with lukewarm water, to which a trace of washing soda has been added. All parts of the separator, spouts, milk float, supply tank, etc., are to be treated in a similar manner. After thoroughly scrubbing in lukewarm water, the parts should be again rinsed in warm water and finished by rinsing in scalding water. Finally the parts are placed in a clean, airy place to dry.

HINTS TO CREAM PRODUCERS.

The Separator.—

(1) Mount the machine level and on a firm foundation.

(2) Test the level of the machine periodically.

(3) Use the best separator oil and lubricate regularly.

(4) Examine working parts occasionally and replace when any wear is noticed.

(5) Examine the spindle and neck-bearing frequently. The spindle, due to careless turning of the crank, may become bent, and through continual usage the neck-bearing becomes slack. An error in these two parts is usually noticeable by a wobble of the bowl at slow speeds.

(6) The height of the bowl requires attention occasionally. With constant use the weight of the bowl will wear down the bearing supporting it, allowing cream to escape through the milk spout. Most makers give instructions for this adjustment. In general, the cream outlet should be $\frac{1}{8}$ inch above the cream spout.

(7) Drain the machine of all oil and flush out with paraffin all working parts at least twice a year.

(8) Run the machine at the correct speed.

(9) When possible, test the skim-milk for fat content.

(10) Purchase a reliable machine, the spare parts of which are easily obtained.

Care of Cream.—

(1) Never mix warm cream with that already cooled until both are at the same temperature. By mixing warm and cooler creams the temperature of the cold cream is raised sufficiently for the growth of bacteria, resulting in fermentation.

(2) Cool the cream immediately after separation.

(3) Use suitable vessels for storing cream.

(4) Never ripen cream in closed vessels; cover only with a clean piece of muslin.

(5) Keep cream as cool as possible in summer.

(6) Low temperatures in the winter cause bitter flavours. To ripen cream for butter-making, hold cream at 70 degrees F.

(7) Stir cream three times daily.

(8) Keep the dairy well aired and scrupulously clean. The presence of fruit, vegetables, meat, etc., will result in second-grade cream being produced.

(9) Remove lids of cans upon arrival from creamery, rinse out with water and allow to dry in an airy, clean place. Scald before use again. Never use soap for cleaning dairy utensils.

(10) Despatch cream frequently to the creamery, and when butter is made on the farm, this should be done every third day in summer and every fourth day in winter.

(11) Do not aim at producing a high testing cream. A 45 per cent. to 50 per cent. in the summer months and 38 per cent. to 40 per cent. in winter gives best results.

Making a Garden in Rhodesia.

HINTS FOR BEGINNERS AND NEWCOMERS.

(Continued.)

By Mrs. E. M. V. Carnegie.

GARDEN SURGERY: PRUNING, BUDDING AND LAYERING.

Pruning is done for several reasons, and there is, as in most other things, a right and a wrong way to do it. The main purpose of pruning is to produce the utmost quantity or quality of fruit or blossom, but it is also done to improve the shape of a plant, to curtail its size and to keep it within bounds. Improving the shape or curtailing the size is usually done by pruning the roots and branches, but it is often more successful to cut the roots when a greater quantity of bloom or fruit is wanted, as in the case of flowering shrubs and fruit trees. Let us take one thing at a time.

Roses.—When transplanting roses the tree should be cut back to about half its original size, all dead wood cut out and all superfluous branches or those that cross or crown others cut right back to the main stem. The roots also should be carefully looked over, and any that have been broken or bruised in the lifting cut away. In autumn, pruning should be done from the fall of the leaf till the new buds begin to swell—say, from May or June until August. It must be remembered that there are two objects in pruning roses: one to produce a few large and perfect blooms, the other to ensure a profusion of bloom, and the pruning has to be done accordingly. If *quality* is desired, the shoots should be reduced by half their length, and all growing into the tree cut away, leaving the few remaining

ones a double share of light, air and nourishment. If, on the other hand, *quantity* is preferred, very little pruning is necessary, beyond the removal of weak or unripened wood and shoots that are too long.

Climbing Roses need scarcely be pruned at all unless they are being transplanted, when they should be treated like any other rose and cut right back. It is usually quite sufficient to get rid of branches that get in the way or refuse to grow the way they are wanted, and to take out dead wood.

Shrubs are pruned in the winter, in June or July. All straggling branches should be trimmed off to keep the bush a good shape, and if it has not produced many flowers it is best to prune both branches and roots. To prune the roots a trench should be made all round the tree, about three feet away from the stem, and the soil removed till the roots are exposed. Then, with an axe that is sharp enough to *cut* and not to split them, half the strongest roots should be cut right through. When this has been done, fill up the trench with fresh, unmanured soil. The following season should produce much more bloom; but if it does not do so, expose the roots again and cut off the remaining ones, filling up the trench again with virgin soil.

Fruit Trees with an unsatisfactory crop, but otherwise vigorous and healthy, can be treated in the same way with very satisfactory results. Should the shrub or tree *not* respond to this rather drastic treatment, it probably needs a change of aspect, and should be taken right up and put in another part of the garden.

Apples, Peaches and Nectarines are pruned in the winter and all old and weak shoots removed. The longest branches may be cut back to half their length. The triple buds, two fat silvery ones on each side of a thin brown one, are fruit buds and must be carefully cultivated. The shoot should be cut off just above them, and branches not showing such buds cut out, as they are useless.

Paw Paw Trees may be topped and the side branches allowed to grow, when the fruit will be produced on all the branches and be much more get-at-able than on the tall single trunks usually seen.

Mulberry and Guava Trees need very little pruning, only the decayed wood being taken out and too long branches shortened.

Climbing Plants are pruned when they have dropped their leaves if they are deciduous, and evergreen kinds just before the new buds appear. All unwanted shoots can be cut right back and all dead wood taken out. Beyond this, no pruning is necessary.

Layering.—Many plants can be propagated by layering, and this should be done when the parent plant is sending out strong shoots, indicating an abundance of vigour. A "layer" is a branch bent into the earth and half cut through. The cut should start just below the joint, continue through it in a slanting direction, and finish in the middle of the stem just above. Then the layer is pegged down and covered with soil, and as soon as roots form can be separated entirely to form a new plant.

With roses the layer must be covered fairly deeply, but in smaller plants, like carnations, pinks, verbenas, petunias, etc., the layer needs covering only about an inch.

Cuttings.—Roses, carnations, geraniums and almost all perennials will grow from cuttings, and most flowering shrubs, though some are more difficult to strike than others. Roses strike very readily. The cuttings should be put in about May or June and kept shaded and moist, not wet. They should be about six inches long and cut slantwise through the stem, and the best cuttings are those taken from wood of one season's growth that has borne flowers.

As a matter of fact it is easy to get cuttings from any bunch of roses. Those that have been cut for the house should not be thrown away when they are faded. The flower should be cut off and the stalk freshly cut at the bottom and put in a box of loamy soil or into the garden in a shady spot, when it will strike more often than not. Remember to press the soil very firmly round a cutting and to keep it moist, and there should not be many failures.

Cuttings of carnations and pinks are taken just below a joint and struck in rather sandy soil, with the addition of leaf mould. They must not be kept too moist or they will

rot before they have time to strike. February and March is a good time to take them.

Salvias, verbenas, snapdragons, pelargoniums and a host of others may be struck in the same kind of soil and in the same months. The cuttings for these plants should be taken from the small new shoots, and they very soon develop roots and become strong and compact little plants that will bloom the same year if planted out in the spring.

Shrubs prefer a heavier kind of soil for their cuttings, which, however, must not be heavy enough to cake and harden, though it must be pressed firmly around them.

In planting cuttings of poinsettia, which is done when the stalk is quite bare of both flowers and leaves, see that the horseshoe mark which is left when the leaves fall is the right way up. It has been known to happen that of a whole row put in to strike, all but three were standing upside down—and the would-be gardener wondered why so few of them grew!

Bougainvillea cuttings are also very often put in wrongly, with the same result. The thorns and twigs should point *downwards*, though it looks wrong, which is some excuse for the mistake being made.

Division of Roots.—All kinds of daisies may be propagated by having their roots divided, when every piece broken away will make a new plant.

This applies also to chrysanthemums, cannas, perennial phlox, verbena, scabious, violets, sweet William and practically all plants that grow bunchily and spread while they grow. They should be taken up when they have finished flowering, divided and re-planted to bloom in the spring.

Bulbs should be taken up every two or three years at a time when their leaves and stems have decayed and their offsets separated. Then they should have a month or two of rest, stored away in a cool and dry place, before being planted again. It is a good plan to cover them with sand to exclude the air, though watch must be kept that they do not get too dry. If they show signs of much shrinkage, the sand must be slightly moistened.

Budding.—Budding roses is a fascinating job and quite an easy one, though very few people, comparatively speaking, know how to set about it. Choose a cloudy day and either very early morning or late afternoon to do it, and use either a proper budding knife, a safety razor blade or a very sharp pocket knife.

Select a bud that is just beginning to swell, and after clearing away thorns and leaves, cut it out with about an inch of bark, half an inch at either end, and a little of the wood. Handle it carefully, and when separated from the stem cut away the woody part, leaving only the bud and the bark.

Now choose a green branch in the bush that is to receive it, close to the stem, and make a cut in the shape of a T just into the bark. Lift the bark carefully and slip in the bud, taking care that it fits snugly and does not poke out beyond the top of the T. If it is too long, cut off a bit and then close the bark and bind it firmly, but not too tightly, with tape or wool. The bud must be left just showing, and very soon it will give signs of growing.

When this happens loosen the binding a bit, and as soon as the cut is healed up and the leaves sprouting, take it away altogether and cut off the shoot immediately above the bud. The bush that is to be budded should be well watered both before and after the operation, and the bud itself shaded from the sun until it is established.

Disbudding.—Disbudding is the removal of all but the main buds on a stem in order to produce finer flowers.

Carnations and chrysanthemums need very drastic disbudding, as they always produce far more buds than can ever come to maturity, even if they are left on the plant; and unless these useless buds are taken away, they simply absorb the nourishment which the larger and better buds should be receiving.

The centre bud on the stalk should be left and the tiny ones each side of it taken off as soon as they are big enough to be handled.

(*To be concluded.*)

Sericulture in Southern Rhodesia.

MR. BRETON'S REPORT.

Several African territories having approached the Imperial Institute in regard to an enquiry into the possibilities of sericulture under the conditions pertaining in those areas, it was arranged to appoint an authority to investigate the matter. Southern Rhodesia was invited to participate in an arrangement by which each State would pay a proportional share of the expenses, and this was agreed to. Mr. Norman Breton, a well known authority on the subject, and chairman of the advisory board on sericulture to the Imperial Institute, was invited by the Imperial Institute to undertake the investigations, and, accepting the task, he arrived in Salisbury on the 14th January last. Mr. Breton spent twenty-nine days in the Colony, and during the course of his investigations he travelled altogether 2,307 miles, visiting different areas in Mashonaland and Matabeleland.

Mr. Breton found that the history of sericulture does not go back very far in Southern Rhodesia, and that beyond the experiments initiated by Colonel Frank Johnson, very little has been done. He mentions that the cocoons produced by Colonel Johnson and his friends were of fair quality for a first attempt, and were reeled in Europe and the silk weaved into a fine piece of damask. He found here and there relics of Colonel Johnson's enthusiasm, but the worms have mostly descended to the cardboard box system which is so beloved of the school children.

The natural food of the silk worm is the leaf of the mulberry. It will eat lettuce, beetroot leaves, raspberry and gooseberry leaves, and doubtless other green meat, but nothing can touch mulberry for the production of a high grade of silk thread. Mulberry grows profusely practically all over the Colony, and there are many varieties, but the

best for silk worms are the Wild Mulberry or *Morus indica* and the Chinese Mulberry or *Morus alba*, with white or black fruit. The variety known in Southern Rhodesia either as the Cape or English mulberry is not suitable.

On the matter of climate, Mr. Breton's visit coincided with the off season for possible silk worm raising, and he had no opportunity of judging the atmosphere. He felt, however, during the whole of this tour that sericulture would thrive. He states that the raising of silk worms under ideal conditions demands a period of six weeks of dry weather, with a temperature between 75 degrees Fahr. and 90 degrees Fahr., and with a night temperature not falling below 70 degrees Fahr. This period should follow immediately after the dormant sap period of the mulberry, when conditions are favourable for a flush of tender young leaf.

Dealing with the economics of sericulture, Mr. Breton says it must be looked upon as a side line. The crop lasts between five and six weeks, and it may be practised once, twice or more times in the year, according to local climatic conditions. It is not an industry that lends itself to mass production in the accepted sense of the term, involving a turn-over running into thousands of pounds; it is usually carried on as a cottage industry. An expert Italian peasant rearer can produce from the current unit of one ounce of eggs as much as 200 lbs. weight of cocoons, which, at to-day's market value of 10d. per lb., gives him a revenue of £8 6s. 8d. He and his family can rear at one time two or even three ounces of eggs, according to the housing space and mulberries at his disposal. In Italy, except in a very few cases, only one crop is produced annually, and the average production over the whole country is 114 lbs. of cocoons per ounce of eggs, giving an annual average income of £4 15s. Mr. Breton does not think a rearer in Southern Rhodesia could expect to reach even the average production of Italy at first, and he estimates a fair figure would be 80 lbs. weight of cocoons per ounce of eggs. But the value in Southern Rhodesia would not be more than 6d. per lb., the extra 4d. being swallowed by charges in getting the cocoons to the European market. So the revenue would be £2 per ounce, or rather more than half what is obtained in Italy.

Mr. Breton asks what good is £2 in six weeks to the average farmer, and expresses the opinion that the farmer would not take to the industry as a commercial proposition unless some scheme can be devised to make it far more attractive. This is dealt with later on in his report.

On the matter of pests, Mr. Breton states that the silk worm is subject to special diseases peculiar to the class of insects to which it belongs, but they can usually be kept at bay by the use of scientifically confectioned eggs and by a proper regard to the rules of feeding and cleaning. He mentions that the Government Entomologist in Kenya has raised a succession of crops of cocoons, and that his raisings have never suffered from pests or diseases of any kind.

RECOMMENDATIONS.

The following are Mr. Breton's recommendations:—

So far silk has not been produced successfully on any scale in countries on or contingent to the Equator. The old silk belt of the world lies between latitudes 25 degrees and 40 degrees north. But in more recent years the industry has been successfully established in the Indian Province of Mysore, which lies between latitudes 15 degrees and 12 degrees north; in Madagascar, which lies between latitudes 25 degrees and 12 degrees south, and in the State of San Paulo, Brazil, which lies on the Tropic of Capricorn, 22 degrees south.

The main factor which appears to have operated against the industry in the tropics and in the southern hemisphere was the neglect of development and the consequent backwardness of civilisation in this portion of the globe. All phases of civilisation, as far as we know them, have taken place in the northern hemisphere, and it is curious to note that the gradual movement westward of dominating empires, starting with China, has brought silk in its train and has left it firmly established. It can no longer be said that the southern hemisphere and the tropics are neglected; on the contrary, the development is now extremely rapid, and I see no reason why, under existing conditions, sericulture should be excluded from the general advancement of the southern hemisphere.

Another important factor is the character of the climate compared with the more temperate conditions obtaining in sub-tropical countries. Owing to the shorter hours of sunshine, the earth cools off more quickly in the tropics, and the night temperatures consequently show much greater variation with those of the day. Silk worms do not like violent changes of temperature, but the question of conserving as far as possible the day temperatures in rearing houses during the night will be gone into later. It is an open question whether the worm will stand up to tropical conditions and whether it will not deteriorate if removed from its natural zone. Personally I am of opinion that its life cycle is too short to be seriously affected, and the chance of cross-breeding is so frequent that it will be possible to establish an acclimatised race before degeneracy can set it.

In my opinion the industry stands little chance of success if confined exclusively to the European population or to the natives. The farmer would hardly consider it worth his while, and the native alone is not sufficiently advanced to make a success of it without a concentration of Government supervision, which might be difficult of achievement in a mixed community.

It would seem to me that a combination of the two elements is the only satisfactory method of attacking the subject, and the problem is in what form it can be done in order to arouse the interest of the European farmers. During my discussions with the farmers' associations the fact emerged that labour on a farm had to be kept fairly constant both in and out of season. I take this to mean that there are periods of the year when the labour is paid for little or no return. Now it so happens that the periods for sericulture seem to coincide with the off-seasons of crops like maize, tobacco and cotton. This is a highly important point, because I think it may be taken that the employment and payment of labour purely for the purpose of raising silk worms is uneconomic. However, if the labour that is being retained on a farm for no return whatever is employed on silk worms, it follows that the employer is getting his silk worms looked after for nothing.

Assuming that this would be so, it occurs to me that it would be possible to evolve a scheme of what, for a better

term, I would call a silk worm village. The farmer would erect a hut on his farm in which to house one ounce of silk worms; he would grow mulberry conveniently near, and would select, say, three boys or girls to collect the leaf, feed the worms and keep the place clean and sanitary under his supervision or that of his wife. If the result was satisfactory the farmer would erect two more huts and place the original labourers who had learned the job in charge of one each, with two new assistants to each hut. He would now have nine labourers in training for the work, and, if results justified it, an extension to nine huts could be undertaken for the next crop. With continued extension properly planned out beforehand, and with a definite programme of mulberry planting in advance of the extension, I see no reason why an éventual erection of fifty or sixty huts should not be possible. This would give the farmer a chance of an eventual income of £100 a year, with possibilities of £200 or £250, according to the number of crops per annum possible and the degree of success attained. I reckon that a safe margin of mulberry would be 400 bushes per ounce of eggs, but this ratio would be considerably reduced as the bushes increased in growth.

As the development of the silk worm village progressed the employer would, no doubt, find that three labourers per hut would be too much, and that the work could be efficiently done by a considerably reduced number.

Some such scheme as this would create a material interest in the industry among the European population, and their intelligence and supervision would keep up the standard of production, while the natives employed would have a sound training in the methods should they wish to carry on the industry in their own kraals later on.

The scheme of a silk worm village would have to develop slowly and surely. It would be fatal to rush it and set up 20 or 30 huts directly the rearing in one had proved successful. That, I am given to understand, is the tendency of the farming community in Southern Rhodesia. The danger of this is not so acute in sericulture, for there is always the planting and development of the mulberry to be thought of in advance of the extension of the huts; but

it may be as well to sound a note of warning in case the farmers' enthusiasm should be fired.

At the meetings with farmers I have offered the suggestion that a modified scheme of co-partnership might be arranged between employer and employed by giving the labourers in charge of each hut a graduated bonus on the production of cocoons obtained. This would give the labourer a direct material interest in looking after the worms properly and should create a healthy spirit of competition between the different gangs.

Areas.—Assuming that the Government, if it undertakes it at all, will accept my recommendations that the industry be built up gradually, I am of opinion that trials should be confined to one area at first, and that it should be extended to others only when the results obtained justify it. I am confirmed in this opinion by my recent experiences in the Union of South Africa.

I would recommend that trials be confined at the outset to the Umtali district. There are people in Umtali itself who would probably be very glad to learn the commercial method of rearing silk worms. Then, within easy distance of the town, there are the three missions—Old Umtali, St. Augustine's and Mutambara. Old Umtali has 300 natives quartered in its property and dependent on it, and it has a big native school. St. Augustine's is concerned with industrial instruction to girls. Mutambara is a good deal larger in having about 1,000 people under its influence, and its property borders on a native reserve. What is wanted to complete the scheme in this area is an enterprising farmer, preferably married and, better still, with a grown-up daughter or daughters, who will start a trial with a view to developing the silk worm village idea. Then there is the Umtali school for Europeans, where one or more members of the staff would, I believe, be enthusiastic. I reckon that about 3,000 people, Europeans and natives, would thus have the opportunity of coming into contact with sericulture, and it would afford the Government an insight into the attitude of the people towards it; and if it grew and prospered, other areas could be brought in gradually. If it were possible to extend the area which I recommend in the first instance to Melsetter, consistent with the close supervision necessary,

it would be a good thing, for I believe that sericulture can be run as a fitting side-line to tobacco. A climate that suits tobacco also suits the silk worm; the tobacco grading sheds could be utilised in out-of-crop time for housing silk worms, and the twigs from the mulberry bushes, when they are pruned, could be used for burning on the nursery seed beds to sterilise the soil. The quantity of twigs, with sericulture carried on in a large way, would be very considerable. So if Melsetter could be included in the original experiment without the danger of neglect of supervision, it would largely add to the interest.

Education.—In attacking the problem of establishing a new industry the importance of instructing the younger generation by practical demonstration need hardly be emphasised. The European schools in the towns, the agricultural schools for both Europeans and natives and the missions and orphanages afford opportunities of doing this. In the case of town schools and orphanages, mulberry trees must be planted in or near the grounds and a rearing house provided unless a room in the existing buildings can be spared. In agricultural schools and missions ground for mulberry would usually be available, and the rearing house could probably be erected by the pupils themselves. A difficulty that I foresee is the fitting in of the crop with the school term, for the pupils should do all the work; a principal would hardly relish being left with a half-reared crop of worms on his hands at the end of a school term, nor would the demonstration have any value if the pupils did not carry it through from start to finish. This is a matter of detail for local adjustment.

The organisation of demonstrations for purposes of education elsewhere than at Umtali should not, of course, be undertaken until the expert in charge of the experiment in that district is satisfied that an extension is warranted.

Planting of Mulberry.—If the Government decides on an attempt to establish the industry, a necessary preliminary is the propagation of mulberry. This should not be a difficult or expensive matter, but it should be undertaken forthwith, as I consider that the mulberry should be established at least eighteen months before any feeding of the silk worms

is undertaken. Cuttings should be planted in the nurseries of the Agricultural or Forestry Departments, which should be ready for distribution in four months or less. If this is done in the district recommended, there should be ample leaf in about eighteen months for a really satisfactory start to be made. The mulberry, after it has been distributed and planted out, should be pruned back to within about eighteen inches of the ground. When the bushes are sufficiently grown to start the feeding they should be pruned right back again to the same height when the sap turns about a fortnight before the silk worm eggs are hatched, so as to provide young and tender leaf for the young worms and so that the growth of the leaf develops with the growth of the worms. It is impossible for me, ignorant as I am of tropical conditions, to lay down definite rules as to the pruning, but from what I have said I hope I have made clear the object to be aimed at, and it must be left to experience to decide how best it may be achieved.

In Nyasaland I heard of the objection that the mulberry developed too quickly for the life cycle of the worm, and that the leaves coarsened before the worms matured. There seems to me to be a simple remedy for this. If all the bushes are pruned simultaneously the growth will develop simultaneously, but if the bushes are pruned by rotation there will always be fresh leaf. Say, for instance, 400 bushes are required to feed one ounce of eggs, the consumption of leaf is exceedingly small at first and only ten bushes need to be pruned in preparation for feeding the very young worms; a further fifty bushes could be pruned a week later, and the remainder a week later still. The desired freshness of leaf would thus run through the whole month of feeding. The figures mentioned are only to supply an illustration and should not be taken as authentic. Experience only can determine how the pruning should be regulated.

In my opinion arable ground which could otherwise be used for the planting of crops should not be utilised for mulberry. The plants could be set about six feet apart as a hedge round the fields. They could also be grown in ravines which are unsuitable for other cultivation. A terrace about four feet wide should be cut along the sides of the ravine twelve to fifteen feet above the bed, so as to ensure

good drainage. It can also be planted round houses or on either side of roads leading to them, but it should not be planted near public highways where dust would settle on the leaves. Once established, mulberry requires very little moisture. It does well in porous soil, and although it grows profusely in soil which holds water, the leaf becomes too sappy and is harmful to the silk worms.

(To be continued.)

The Injurious Effect of Weeds on Maize Yields.

By H. C. Arnold, Manager, Salisbury Agricultural Experiment Station.

Experiments conducted at the Agricultural Experiment Station, Salisbury, during the past season clearly showed that the presence of weeds in maize fields causes a considerable reduction in the yield of grain.

The land chosen for these experiments had been dressed with farm manure during the previous season at the rate of ten tons per acre, and was therefore in a fairly high state of fertility. All weeds were destroyed by thorough cultivation with a disc harrow immediately before the crop was sown, and after that the area was divided into twenty-four equal sized plots.

The original plan was on eight of the plots to allow weeds and maize to grow together without further cultivation, to suppress the weeds without disturbing the surface soil on another eight plots, and on the remaining plots to practise the usual methods of cultivation by machine between the rows, followed by hand hoeing to destroy any weeds that remained.

Owing to mistakes on the part of the native labourers employed, the original plan was somewhat modified, and all plots received one machine cultivation when the maize plants were about six inches high, which destroyed much of the weed growth between the rows. This, however, was replaced to some extent by a second crop, so that during the greater part of the growing period the weedy plots were fairly heavily infested, with the exception of three, which again inadvertently were cleared of weeds by over-zealous labourers.

Finally, part of the crop was stolen from two of the "cultivated" plots, so the yields of nineteen plots only are available for comparative purposes. These are given in the following table:—

Average Yields of Maize in Bags per Acre.

1. Yield over five plots fairly heavily infested with weeds	14.59
2. Yield over eight plots on which weeds were suppressed without disturbing the surface soil	17.27
3. Yield of six plots to which thorough cultivation was given—i.e., three to four machine cultivations and twice hand hoed	19.21

The crop was sown on 6th December and the weather conditions were favourable for growth until the middle of March, after when, owing to the cessation of rain, rate of progress was somewhat reduced.

The dominant weeds were Peruvian gooseberry (*Physalis Peruviana*), black jack (*Bidens pilosa*) and rapoko grass (*Eleusine indica*).

These results are those for one season only, but they afford strong evidence of the great importance of good cultivation in this Colony, and indicate that the mulch of loose soil created by the cultivators also had a beneficial effect on yield.

Talks to Poultry Keepers.

CULLING: A SEASONABLE OPERATION.

By the POULTRY BRANCH.

The system adopted by individuals for the annual renewal of their laying stock may vary, but there are very few modern poultry keepers who do not rear a certain number of pullets to replace a proportion of the older birds. What the proportion may be depends upon the circumstances, but in any case it is during this time of the year that it is desirable to settle the pullets in the quarters they are to occupy during the coming scarce season. Arrangements should be made to pen the young stock as they redden up, so that they may settle down comfortably to produce eggs during the scarce season of the year—the real red letter months to the poultry keeper.

The pullets should have been grown and developed to reach maturity and start laying at the age of from six to seven months. The drafting of the pullets to permanent quarters is important, and should be done during this and the next two or three months; delay in this respect may be uneconomical. All matured, vigorous pullets should be kept. Any weak, undersized, late-hatched or deformed pullets should be culled.

It should always be remembered that proper culling reduces the feed bill, but not the egg production. The poor layers or unprofitable birds should be culled each year from the flock and disposed of, not only to save in the cost of food, but also to make room for the present season's young stock.

The real problems in culling are found with hens that have finished one or two laying seasons. The general rule

with pullets is to keep all of them, and with aged hens to dispose of all, but in the case of yearling hens and two-year-old birds, some should be sold and others kept, for obviously it is unprofitable to keep low producing hens. To cull hens of these ages, every bird must be handled to determine her value. Nature has marked the poor producer, and the poultry keeper should read nature's record; culling, therefore, is the process of picking out by external appearance the low producing hen. Study and careful observation have secured accuracy and simplicity for this purpose. In order to keep an accurate account of the ages of the hens, each bird should be toe-punched or ringed with coloured leg bands.

When to Cull.—Pullets, if hatched during the proper breeding season, should start laying from about November or December. They should continue to lay through the autumn and winter and reach their highest rate of production during the spring months (August and September). Any high producing hen will continue this production well into the summer or autumn; after this she stops laying, moults, and is ready to start laying eggs again. The poor layer may stop laying about October or November, and the ideal time to give the flock a complete culling is when the poor producers stop laying. Fortunately, most of these birds can be sold on the Christmas market at a good price.

The age of a bird influences her egg production, and egg production decreases with age. Age, therefore, has an important bearing in culling. The first laying period is the most productive period of the life of the flock, and there is usually 15 to 20 per cent. decrease in the number of eggs each succeeding year. Among the heavy birds, only those that show the marks of high production should be kept over the second year. With the light breeds, a larger percentage can be kept profitably for the third year, but should be disposed of at the end of that period.

To cull a flock systematically, every bird should be handled, and if a large number of birds are to be caught, labour-saving devices for catching them should be employed. A coop or crate open at one end, so that the birds may be driven through a small door in the fowl house directly into the crate, is a great convenience. The catching coop need

not be elaborate, but should have a removable slab on one side and also on the top, so that the birds can be driven in or lifted out without disturbing the flock unduly. Another convenient method for catching the birds is to take a section of wire netting or a suitable frame-work with wire netting, which can be used to surround or corner off a group of the birds.

Guides in Culling.—To cull effectively, it is necessary to have some idea of the characteristics to look for. The best and worst producing hens will show certain characteristics to guide the poultry keeper at culling time, apart from the use of the trap-nest or consideration of the age of the birds. These are as follows:—

(1) Vigour.—Best producers: Strong, healthy, active, tame. Worst producers: Lazy, inactive, wild.

(2) Moult.—Best producers: Not moulting before December. Worst producers: Beginning to moult early.

(3) Pigmentation.—Best producers: Shanks and beak pale; comb full and waxy, showing a good circulation of blood. Worst producers: Prominent yellow in shanks and beak of yellow-legged varieties; shrivelled comb.

(4) Abdomen.—Best producers: Soft and pliable; pelvic bones straight and soft; skin soft and fine; good depth of abdomen. Worst producers: Hard and rigid; pelvic bones firm and thick, close together; abdomen contracted.

In applying the culling system each of the above four distinguishing qualities should be given consideration. There should be no difficulty in picking out the best laying or the worst laying portion of the flock, as there is a remarkable correlation in these characteristics in either the extra good or the extra poor layers.

With some birds, especially among the medium layers, the distinguishing marks are not quite so distinct, and may even be found to be contradictory unless the previous treatment of the hen is known.

For example, hens that have been moved from one house to another are likely to be forced into an early moult. A premature moult is also caused by an abrupt change in feeding, especially by a lack of protein in the ration. Also, hens that are consistently broody frequently show that they are in laying condition at culling time, yet their yellow shanks show that they are not consistent layers. The same may apply to a hen that has raised a brood of chickens. Such hens may be given the benefit of the doubt, unless the birds are being culled very closely with the idea of keeping only the highest or profitable producers, when those in the doubtful class should be disposed of. If only the unusually poor birds are to be sold, then those showing uncertain characteristics may be kept. Any person who will examine a few hens, keeping in mind the characteristics of the good producer as opposed to those of the poor producer, should be able to cull satisfactorily. It may be advisable as a test for the accuracy of culling to keep the culled hens apart for a week or two and their egg production noted.

SUMMARY.

Aged Hens.—Sell all Rhode Island Reds, Wyandottes, Orpingtons, Sussex, Plymouth Rocks and other birds of the heavier types when they have finished two laying seasons. Sell all Leghorns, Minorcas, Anconas and other birds of the light breeds at the end of the third season.

Pullets.—Sell all weak, deformed, late-hatched and undeveloped pullets. Keep all mature, vigorous, healthy pullets.

Yearling Hens.—Dispose of all weak, sickly or over-fat birds, and those moulting before the average of the flock with prominent yellow shanks and beak, small, hard abdomen and pelvic bones close together.

Save these Hens.—Healthy, active, moulting later than the average of the flock, with pale shanks and beak at this time of the year, with soft, pliable skin and abdomen, good depth between pelvic bones and end of keel, with pelvic bones thin, straight, flexible and wide apart.

Producers' Direct Supply Co-op., Limited.

FORMATION OF NEW COMPANY.

Synopsis and explanation by G. W. MARSHALL, Government Horticulturist.

At a meeting of the Mashonaland Farmers' Association held in Salisbury on 10th October, 1930, it was decided to form a co-operative company under the above title.

The objects of the company as shown on the prospectus are:—

(1) To promote the agricultural industry, with particular reference to the improvement of local marketing conditions:—

(a) by raising the standard of quality of farm produce for local consumption;

(b) by arranging for adequate supplies of good quality farm produce in season at reasonable prices to the consumer;

(c) by preventing the glutting of local markets;

(d) by returning payable prices to the grower; and

(e) by eliminating inferior produce from local markets by providing for its utilisation in the manufacture of by-products.

(2) To establish depots and/or selling agencies at Salisbury and Bulawayo, and, in time, at other centres.

(3) If considered practicable, to undertake the production or manufacture of such commodities as are suitable for Home consumption and/or for export.

The writer has received numerous letters of enquiry from individual farmers, and it seems that a fuller explanation would not be amiss.

The prospectus published, and already distributed to 63 farmers' associations and 450 individual farmers, covers a very wide field. Certain objections may be raised on these grounds, but the provisional board of directors has considered this advisable, so that any contingency which may arise will be fully covered, and further, will not be amiss at some future date when the company is established on a flourishing basis.

To ensure the complete success of the objects of the company, it must be impressed on the farming community that salvation lies in their own hands. That salvation is complete co-operation in every town and on every farm throughout the length and breadth of the Colony.

To certain persons co-operation may have proved an unpleasant experience. This may possibly be accounted for by the fact that in the past certain co-operative companies have commenced with high hopes and every good intention, but in too large a way, with the result that the foundation has been faulty. In brief, they have begun at the top of the ladder instead of commencing in a humble way on the bottom rung.

To many of our producers it may appear that at the present time of general depression it is inopportune to consider the flotation of the proposed company. Possibly this may be, as a large capital will necessarily be unavailable, but this difficulty can be overcome if our producers are determined to co-operate in the true sense of the word and see the venture to a successful conclusion.

It is fully realised that many of our farmers cannot lay their hands even on the small sum necessary to join the movement; however, where there is a will, there is a way. A suggestion is that they should dispose of an odd beast or an article of no actual value in their present farming operations. This should not entail any hardship when it is realised that to purchase the minimum number of shares, *i.e.*, 10, it will only be necessary to deposit 25 per cent. of their value, namely, £2 10s., the foundation shares being £1 each.

In making this appeal to the farming community for its support, it is hoped that those who are in a position to make an immediate cash outlay will subscribe by purchasing a fair number of foundation shares (with a prospect of 10 per cent. dividend). This appeal is also extended to those non-producers who are unable to participate actively at present, but are likely to at a later date when they are in a position to supply marketable produce.

Capital.—Reverting to the company itself and its composition, it has been found necessary to have a capital of £500 to commence operations, or 5s. per share of the 2,000 foundation shares of £1 each on the market. This issue will carry a liability of £1,500, which may be required for the purpose of raising loans should such a course become necessary. This uncalled capital, although a possible liability to shareholders, will not be called up unless there is no possibility of finding more satisfactory means of financing the company's operations. In any case, the levy share scheme should meet all future capital requirements, failing which, the uncalled capital will be called up in small instalments with payments either in cash or produce.

Registration.—If sufficient capital is forthcoming, it will be necessary for the board of directors to submit a copy of the articles of association, together with any other documents that may be required, to the authorities concerned for their approval before registration can be effected.

The writer has devoted a considerable amount of time to studying co-operative and other methods of marketing farm produce during the past decade. These observations have revealed many weaknesses in the existing marketing methods, and, it is hoped, will prevent a recurrence of past mistakes.

It is a truism that all modern successful business houses owe their success to small beginnings on solid foundations. This course is to be followed by the Producers' Direct Supply Co-op., Limited. Should the company materialise, it is the intention of the management to purchase all produce outright and then dispose of it at the central depots or by other approved methods. Agency work will be undertaken for the

distribution of locally grown tea, coffee or other produce not already catered for by existing co-operative bodies.

As a certain amount of misapprehension appears to exist in the minds of prospective members, it is therefore as well to mention that the directors intend to embody the following clauses in the articles of association:—

(a) Shareholders will be permitted to retain existing contracts entered into by them.

(b) The company will enter into agreements with its shareholders for the disposal of fruit, etc., or the whole of their produce.

(c) Shareholders will be debarred from retailing any of their produce (such as is handled by the company) where company depots or agencies exist.

This is a necessary precaution to safeguard against shareholders competing against themselves. It will not, however, debar them from selling in wholesale quantities to the trade.

Overlapping.—There is a possibility of a certain amount of overlapping occurring with the already existing co-operative societies, but this will be guarded against.

A minor but important item is the card index system to be adopted in the company's administrative work. It is intended to supply each member with special post cards, to be posted each month to his agency or depot, detailing the marketable produce which he will have for disposal through the company. These cards will be filed systematically and the producer will be informed when and where to deliver his goods. No produce will be accepted from members who fail to furnish the required information or comply with the necessary instructions. By this method it is hoped to regulate supplies and prevent a glut on the market.

It will be as well to mention that many, if not most, of the larger producers have signified their intention of becoming members, but as the movement is primarily for the small growers who are unable to find markets, the latter are urged to send in their applications early in December.

Application forms will be sent to interested parties if they communicate with the acting secretary, P.O. Box 827, Salisbury.

In conclusion, the writer would add that his interest is purely of an honorary nature and will necessarily entail a good deal of extra work. However, it is felt that the farming community requires a lead and some sort of assistance until the scheme is organised on a sound basis and is running smoothly as a going concern.

A Green Manuring Trial.

The following interesting report on a green manuring experiment carried out in Matabeleland will be of interest to maize growers in that part of the Colony. It should be particularly noted that the soil on which the trial was made was in a very low state of fertility and heavily infested with couch grass; also that Mr. Bowe failed apparently to give the second ploughing before planting, which is so advisable where green manuring has been practised.

Below I give particulars and costs of a green manuring trial conducted on two acres of black sandy loam (practically played out) in 1928-29 and 1929-30:—

Expenses, 1928-29.

	£	s.	d.	£	s.	d.
Ploughed, 29th and 30th Dec., 1928	0	3	0			
Dolichos bean seed, 40 lbs.	0	7	0			
Harrowed and planted, 1st and 2nd Jan., 1929	0	2	6			
Hand hoed and cultivated, 11th to 15th Feb., 1929	1	5	0			
Disced and ploughed in beans, 14th April, 1929	0	6	0			
				2	3	6

Expenses, 1929-30.

	£	s.	d.	£	s.	d.
Harrowed and planted to maize, 7th Dec., 1929	0	4	6			
Seed maize	0	3	0			
Cultivated, 16th Dec., 1929	0	1	0			
Hand hoed, 17th Dec., 1929	0	2	6			
Fertiliser (bone and super)	1	8	0			
Suckered, 26th Dec., 1929	0	5	0			
Cultivated, 11th Jan., 1930	0	1	6			
Top dressed for top grub	0	1	0			
Reaped, 5th April, 1930	0	7	6			
Cartage	0	2	6			
Bags	1	2	0			
Shelled, 30th June, 1930	0	3	6			
Transport to station	1	0	0			
				5	2	0
Total expenses for two seasons				£7	5	6
Reaped, 23 bags maize at 8s.				£9	4	0
Reaped, 1½ bags seed at 25s.				1	17	6
				£11	1	6
Less expenses, two seasons				7	5	6
Profit at end of second season				£3	16	0
Cost per acre preparing plot, 1929				£1	1	9
Cost per acre growing maize, 1930				2	11	0

Owing to the rapid growth of weeds and twitch grass in 1929, the cost of hand hoeing and cultivating was heavy (see item "Hand hoed and cultivated, £1 5s.").

Loss through top grub, natives and other pests, about 10 per cent. There was no diplodia in this plot, and only a few cases in the main crop.

The seasonal rainfall was 19.22 inches, there being 29 rainless days in January and 20 days in February.

No charge for depreciation on oxen and implements has been made. Oxen reasonably worked and well cared for should, after five or six years in the yoke, sell at a profit sufficient to cover above charges and herding.

Being a member of the Maize Farmers' Co-op., Ltd., it is impossible at the present time to say what the pay-out will be, but I believe 8s. per bag is the price offered for large quantities just now.

F. J. Bowe.

Nyamandhlovu.

Army Worm.

WARNING.

Whilst there is no special reason to anticipate an outbreak of Army Worm (Laphygma exempta, Wlk.) this season, farmers are warned to look out for this pest during the second half of December. The caterpillars usually appear on sweet grass, and especially on "rapoka" grass on maize lands. The appearance of this pest should be notified immediately to the Department of Agriculture. Protective measures are dealt with in the "Rhodesia Agricultural Journal" for October, 1930, page 1055 et seq., reprinted as Bulletin No. 796.

Sprouting of Potatoes by Carbon Bisulphide.

ANOTHER EXPERIENCE.

The following report on the success obtained by the carbon bisulphide method of accelerating the sprouting of potatoes for late winter and early spring planting is kindly supplied by Mr. C. B. King, Msonzoa Farm, Banket.

The potatoes were first set out for planting on the 30th of June without any treatment. By the 21st of July (21 days later) none had started to sprout, and on that day I treated them with carbon bisulphide. On the 30th of July (10 days after treatment) I received a visit from a Government official, whom I asked to have a look at the potatoes and whether he thought they had sprouted sufficiently for planting. In his opinion they were ready for planting. However, I was not able to plant out the potatoes until the 23rd of August on account of late frost. The potatoes flowered after being in the ground seven weeks. The method employed and the treatment were as follows:—

I used an old native hut which had been plastered on the inside with clay. Sacks were used for a ceiling to make the hut more airtight. About one foot from the ground I made a table of sticks which I covered with grass. Fifteen inches above this table I placed a similar table. On these tables the potatoes were laid in a single layer. The carbon bisulphide was placed in a jam tin in the centre of the bottom table. The doorway of the hut was closed with sacks nailed across it. Twenty-four hours after treatment the sacks over the doorway were removed. It was found that about three-quarters of the carbon bisulphide had evaporated.

Is the Conservation of Soil Moisture Essential?

By E. G.

A short time ago the writer was discussing farming problems with two fellow farmers—one a young man fresh from an agricultural college. The subject of conserving soil moisture called forth the following remarks from the young man, "Oh, there is nothing in that theory; besides, there is no moisture you can conserve in our dry land, especially during winter." The elder man remarked, "That idea was quashed years ago—allow your land to lie as rough as possible as long as possible."

The latter is right enough in a temperate climate without long daily hours of sunshine, and where the farmer is more dependent on frost than on the sun to help pulverise and clean his land. In a tropical country, with scorching sun and drying wind, and evaporation exceeding rainfall, one must conserve moisture rather than dry it out.

The accompanying illustrations may help to show that where attention is paid to conserving moisture it is both beneficial to the crop and to the land.

Fig. 1.—A good stand of maize on new land (first crop); yield, 16½ bags per acre.

Fig. 2.—Old maize land, after a crop of Red Canadian Wonder beans, 200 lbs. per acre of rock phosphate ploughed in. Tillage: Two ploughings, harrowed and rolled and left until planted (29th November); again harrowed, cultivated twice by oxen and twice by hand.

Fig. 3.—Portion of same field (No. 2) neither rolled nor harrowed, but left in the rough until planted (29th November). Tillage: Two ploughings (fertiliser as above), left until seeding; harrowed, four cultivations by oxen, four

cultivations by hand. Although extra cultivation was given after planting, there was no reserve of moisture to help carry the crop through the drought of February and March. The maize cobs are conspicuous by their absence, and this shows that after-cultivations, which are more expensive, are less beneficial in a dry season than a well prepared seed bed.

Fig. 4.—Here can be seen a first year and second year crop of maize. On the left of the illustration is the first crop on new land. Preparation of seed bed was good and moisture conserved. The plants are good and well developed. On the right hand of the illustration is the second year crop, which generally in Rhodesia in a normal season is better than the crop on new land. In this case it is the reverse. The soil is the same, but when the land was broken in 1928-29 indifferent and unsuitable ploughs were used, and although the ground was ploughed three times, the soil was never thoroughly turned over and the trash buried; nor was it ploughed deeply and evenly. In a season of sparse rainfall the previous year's work shows. To counter-balance this indifferent work in the previous year, extra cultivation was given, but, as can be seen, the plants are stunted and undeveloped, and the land is still full of veld grass.

Fig. 5.—Is the same subject as fig. 4, but showing the husked ears and the maize stubble.

Fig. 6.—Illustrates how a green manure crop, by giving humus and helping to conserve moisture, can be more beneficial in a dry season than fertiliser. On the left is maize after Sunn hemp ploughed under in March and land cross ploughed and harrowed in April. The maize here is unaffected by the drought. On the right is maize with 200 lbs. per acre of rock phosphate ploughed in and the land left in the rough until planting. The whole field was seeded on 30th November, and double the amount of hand cultivation was given to the fertilised section as compared with that green manured.

Fig. 7.—*Breaking of new Land.* This illustrates the value of harrowing behind the plough. In the foreground is land not harrowed after the first ploughing. In the second ploughing it is turned up very rough, with much unburied trash. In the background, after being harrowed, the soil

turned over in a well broken condition, leaving a good tilth and no trash.

Fig. 8.—New land ploughed first on the 14th March. Ground too dry to permit the ploughs to penetrate more than four inches. Harrowed and rolled and left until the 31st March, when, through the capillary action and the conserving of moisture by harrowing and rolling, the plough was able to penetrate to nine inches, although only half an inch of rain had fallen in between—namely, on 20th March.

It is interesting to note that from the commencement of the rains on the 28th November to the 31st March, after when further rain was useless to the crop (132 days), 82 days were without rainfall, while over 26 days the rainfall was less than half an inch. Under 5 inches fell during February and March together. On 28th February the ground was too dry to permit the ploughing in of Sunn hemp, and remained so until the 10th March, while again on the 25th March the ground was too dry except for the cross ploughing of new land.

NOTE BY THE CHIEF AGRICULTURIST.

Of late years a number of scientific investigations have been carried out—particularly in the United States of America—with the object of ascertaining the extent to which the maintaining of a mulch of loose soil on the surface of the land, by means of cultivation, may be expected to check the evaporation of soil moisture and so assist a crop to tide over prolonged periods of drought.

On the Illinois Experiment Station, over an average of nine years, it was found that maize on land ploughed and prepared in the ordinary way and receiving subsequent cultivations while growing yielded 43.4 bushels per acre, whereas the crop similarly treated, except that weeds were only scraped off with a sharp instrument and no actual stirring of the surface soil was effected, yielded 48.9 bushels per acre. Numerous other experiments offer confirmatory evidence that where vegetative growth has been suppressed, the presence or absence of a surface mulch has had little effect on the loss or conservation of soil moisture.

The presence of large numbers of weeds amongst a growing crop naturally increases the amount of water taken from the land in the process of transpiration of the plants, and it is generally suggested that the suppression of the weeds by means of cultivation is the potent factor in improving the crop, rather than the maintenance of the soil mulch. The loosening of the surface, however, confers other benefits by improving aeration, influencing the amount of plant food made available, and rendering the land better able to absorb subsequent rain which may fall.

Whatever may be the results in other countries, it is an undoubted fact that in Rhodesia, *and given land equally free from weeds*, a maize crop which is kept well cultivated during periods of drought will show less distress and eventually yield better than one which is not similarly cultivated.

It has also been proven time and again in this Colony that crops growing on land well supplied with humus by means of a recent green manuring are more tolerant of prolonged periods of drought than similar crops on land deficient in humus.

Our correspondent's statement that after ploughing, the harrowing and compacting of either new or old land is eminently desirable and is preferable to leaving the land in a rough and cloddy condition throughout the winter, can be supported whole-heartedly. The latter course serves no good purpose whatever, while several unanswerable arguments can be advanced against it.

Since the foregoing notes were written, we have received a further letter from "E. G." as follows:—

"This morning I was discussing with a man—not a farmer—the usual farm topics, and the matter of conservation of moisture cropped up. He raised a very interesting point, which I suppose was quite a natural and general one on the face of things—the impossibility of evaporation to be greater than the rainfall. He referred to my article, 'Conservation of Water,' in the 'Rhodesia Herald' of 8th August—i.e., rainfall at Mazoe Dam, 52.60 ins.; evaporation, 66.97 ins. There, of course, it is possible on a sheet of water, but on land, from that point of view, it does not look sense; while

Fig. 1.
A good stand of maize on new land.
Yield, $16\frac{1}{2}$ bags per acre.

Fig. 2.
Old maize land after a crop of Red Canadian Wonder beans, plus 200 lbs. per acre of rock phosphate, ploughed in.

Fig. 3.
Portion of same field as Fig. 2, neither rolled nor harrowed.

Fig. 4.
On left, first crop of maize on new land. On right, second year crop.

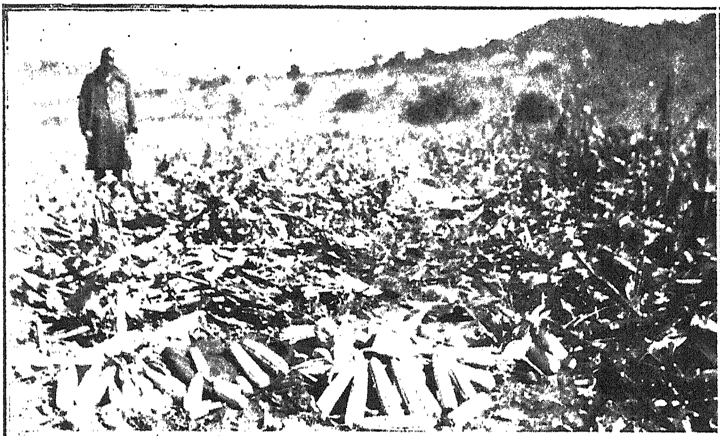


FIG. 5

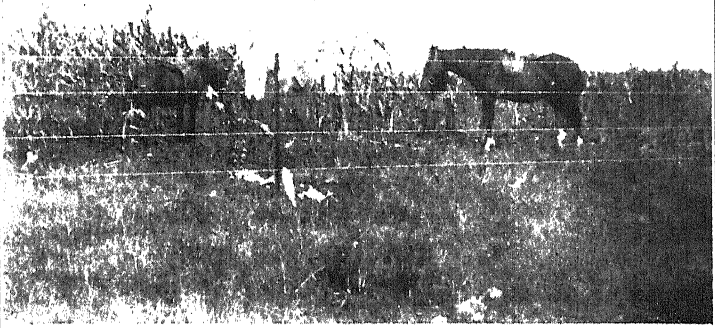


FIG. 6.

Fig. 5.

Same subject as Fig. 4, but showing husked ears and the maize stubble.

Fig. 6.

Showing how a green manure crop, by providing humus and helping to conserve moisture, can be more beneficial in a dry season than fertilser.

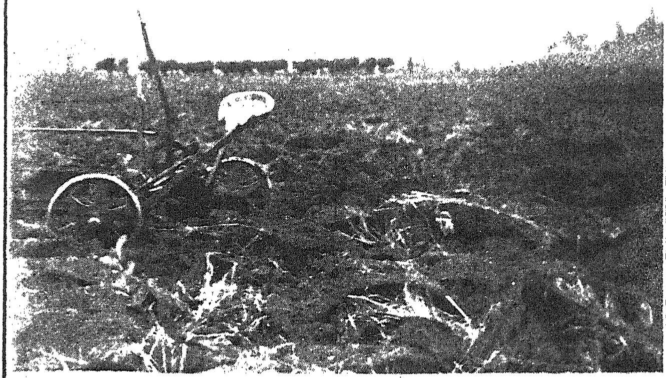


FIG. 7

FIG. 8

Fig. 7.
Breaking up new land, showing the value of harrowing behind the plough. (See text.)

Fig. 8.
New land, ploughed 14th March. (See text.)

the great point is to so prepare the seed bed to delay or prolong evaporation as much as possible. Say, for instance, a fall of rain of 5 ins., followed by a dry spell of a month or more; if the ground is in a fit state and can hold the moisture and delay evaporation, the crop in the meantime may mature or stand till the next fall of rain, with only a 5 per cent. failure against a possible 95 per cent. failure. This, I think, is fairly clearly shown in illustrations 2 and 3. Perhaps the Chief Agriculturist in his notes would make this point very clear. It seems that farmers, when they choose, can very easily misunderstand things, as the same subject cropped up again, and this time by a man who has done a good deal of irrigating. His contention is that it is quite impossible to conserve moisture. I can only say that my 30 odd years of farming experience, over nine of them in Rhodesia, has taught me something different. It is not my desire to dictate, but to give, if possible, the little experience I have gained for the benefit of those of lesser experience. That also must be my excuse with troubling you with the foregoing."

Readers are referred to the notes which appear elsewhere in this issue of the Journal entitled "The Injurious Effect of Weeds on Maize Yields," by H. C. Arnold.

SPINELESS CACTUS.

It is notified for general information that a limited supply of spineless cactus blades are available for distribution this season from the Salisbury Experiment Station. It is not anticipated that more than 10-12 blades can be supplied to each applicant.

Applications should be made to the Chief Agriculturist, Department of Agriculture, Salisbury.

Zimbabwe Ruins, Southern Rhodesia.

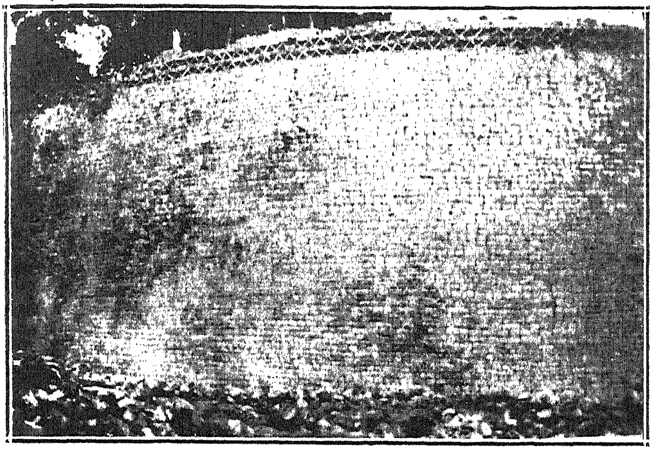
By S. C. Wallace, Curator, 1910-30.

The re-discovery of the Zimbabwe Ruins in 1868 is due to Adam Reuders, an American. There are many theories advanced as to the origin, age and use of the many buildings, but there are practically no reliable data available. Possibly systematic work carried out at known ruins in Rhodesia and the exploring of the ancient routes to the east coast supposed to exist might reveal something.

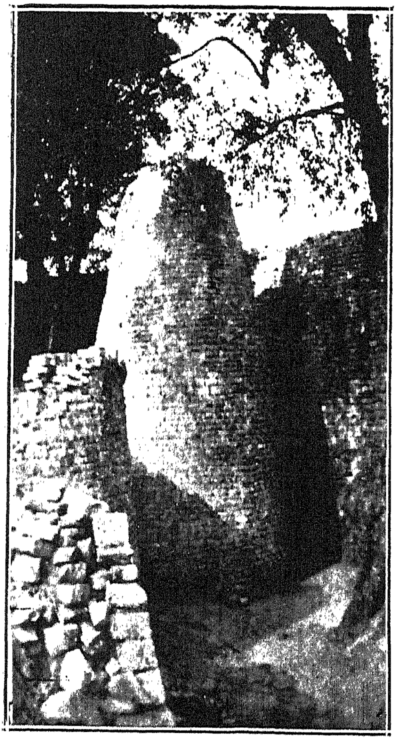
Many theories have been put forward by various writers. Some attribute the work to the Phoenicians, Carthaginians, Sabaeans, Egyptians and to the Bantu. In the opinion of the writer it is almost impossible to imagine the last-named having had anything to do with the building, except possibly of being compelled to bring the necessary building material. Whatever else it may be, the building of such an edifice was a prolonged and very concentrated effort, and one cannot associate the Bantu with either of these two qualities.

The Ruins keep their secret and remain unsolved. Being unrevealed increases their fascination, as it is in these days refreshing to find a place where no definite date can be given.

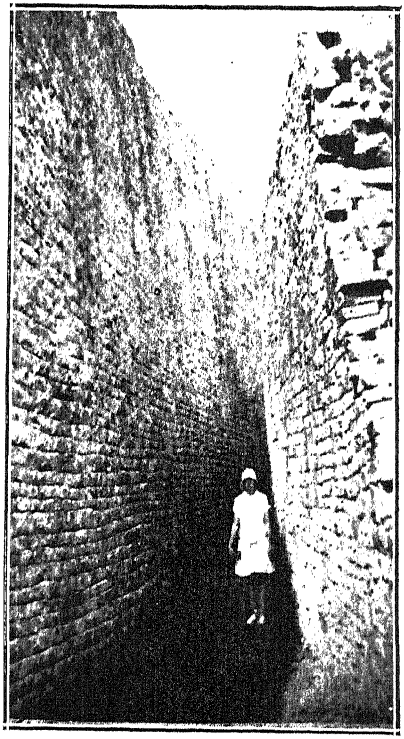
Having been responsible for all the restoration work which has been going on since 1914, I feel I am competent in saying that to erect such an edifice requires great skill, concentration, incalculable patience and a very prolonged effort, especially so as the work is all dry masonry, which, needless to say, adds very much to the difficulty in building; and when one considers the enormous painstaking labour involved in cutting and shaping the granite blocks necessary for building the large and small circular cones, curved entrances, curved passages, etc., one begins to realise in a small way the stupendous labour and the time it must have taken to build such an edifice.



Eastern wall of temple, Zimbabwe.



Conical tower of temple, Zimbabwe.



Parallel passage inside of temple, Zimbabwe.

A conservative estimate of the number of tons of granite blocks used in the main wall only of the elliptical temple is 80,000 tons. This big girdle wall, with its chevron pattern on the eastern side, is an imposing sight, and the work has been carried out with great skill.

During my twenty years' curatorship of the Zimbabwe Ruins I have never found any quantity of splinters or chippings of granite. This indicates that the shaping and cutting of the innumerable blocks of granite must have been done from where they were quarried. There are no indications of any quarry in the near vicinity. It is more than probable that the enormous number of granite blocks were collected from some distance away and carried here by forced labour by hand—an almost incredible labour.

Who the builders were and why it was erected is not known. The elliptical ruin known as the temple certainly lends itself to some form of ceremonial worship.

There are no signs of any inscriptions and nothing of a hieroglyphic character has ever been found, nor can any trace of a burial ground be found.

The aeropolis (a-kropo-lis), a citadel, is undoubtedly built on defensive lines, and whoever selected the position was in possession of a military mind and utilised the natural boulders and crevices with great skill. It is practically inaccessible on three sides, and on the remaining and more accessible side there are distinct traces of terraces.

It may have been a slave depot, a collecting centre for gold prior to despatch to the coast ("Sofala"). Nothing can be said with certainty.

SEED MAIZE.

It is notified for general information that all seed maize, whether best seed or tips and butts, supplied this season from the Government Farm, Gwebi, has been treated with Tillantin R. as a preventative against diplodia. The seed, therefore, is poisoned, and should be taken care of accordingly.

The Maize Commission.

The following are the terms of reference of the commission which has been appointed to investigate and report upon the maize industry in Southern Rhodesia:—

1. The financial position of the maize growers of the Colony and the causes which have led to it.

2. The production per acre during the period for which statistics are available, with the causes and reasons for the rise or fall, as the case may be.

3. Prices received by the producers during the period for which this information is available—namely, (a) the local price; (b) the export price.

4. The cost of production, with any suggestions that can be made with a view to reducing this.

5. The effect, if any, of native production on the local price.

6. The forms of market control of agricultural products which have been adopted by other countries, with any particulars available of their effect on market prices.

7. The administrative machinery required to apply such forms of control to the Colony, with estimated cost, and how such control can be applied to native-grown maize.

8. The effect such forms of control would have in the Colony on the local and export price of maize, and the immediate and ultimate results to the grower and to the community.

9. Alternative methods of assistance to the maize grower.

10. Any further information which in the opinion of the committee is relevant to the enquiry.

In addition to this commission, steps have been taken to obtain, if possible, the services of an eminent British economist to consider the report of the commission and submit his views.

Do You Know?

How to grow ground nuts.

How to preserve Rhodesian timbers.

About the growing and curing of dark fire-cured tobacco.

Of the results obtained at the Bulawayo Municipal Demonstration Station.

The results of the agricultural costings at Gwebi Farm.

The markets for Southern Rhodesia sunflower seed.

Points to be observed in cream production.

How to convert and utilise Rhodesian timbers.

How to construct reinforced brick and concrete tanks up to a capacity of 20,000 gallons.

The importance of destroying maize trash after reaping.

About successful poultry rearing.

The results of the crop experiments at Salisbury Experiment Station.

How diplodia can be controlled.

How to cure bacon on the farm.

How to build a low concrete dam.

The results of a feeding experiment with dairy cows at Redbank.

The important pests of citrus in Southern Rhodesia and methods of control.

How to utilise local timbers for fencing.

How to feed dairy stock.

The best methods of preventing soil erosion.

How to make a garden.

About the army worm.

The effect of weather conditions on the yield of maize.

Correspondence.

[No responsibility is accepted by this Journal for the views expressed by correspondents.]

The Editor,
The Rhodesia Agricultural Journal.

Sir,

The Army Worm.

I notice in Mr. Rupert Jack's article on the army worm no mention is made regarding the time of the year the moth is on the wing.

Mr. Jack states that the moth is a night flier. It seems to me a practical way of destroying it would be to light fires at night, thereby attracting it to its destruction.

In conversation with an old native who came from a locality where veld fires have been raging this year, he informed me that the kraals were burning out the "schelms." When I asked what "schelms," the first one he mentioned was the "munduru" (army worm). There may be more in this than meets the eye.

I am, etc.,

L. R. Hartley.

Wondedzo Farm,
Fort Victoria,
24th October, 1930.

The foregoing letter has been submitted to the Chief Entomologist, who comments as follows:—

I would state that the position in regard to the periods during which the moths of the army worm are on the wing is in reality clear from my article (see Records of Outbreaks). The position is that there is no fixed period in the year during which the moths are active in this Colony. The most destructive outbreaks of caterpillars have, however, occurred in

late December and early January, which points to the moths in these cases having been active during the second and third week in December—*i.e.*, about a fortnight before the outbreaks came to notice.

With regard to the lighting of fires to attract the moths to their destruction, it may be said that light traps are now hardly regarded as a practical means of controlling pests of this family by destroying the adult moths. Even under the most favourable conditions the number of the insects attracted is comparatively small, and usually by far the greater number caught are males. Purposeful observations have not been made, as far as I am aware, with this particular insect, and such observations are desirable; but it may be stated no abundance of these insects at ordinary sources of light have ever been recorded by entomologists in this Colony previous to an outbreak of the caterpillars. In view of the vast numbers of moths which must be on the wing previous to the egg-laying which results in hordes of caterpillars, entomologists, who are naturally interested in such occurrences, could hardly have overlooked the attraction of large numbers of one species of moth into lighted rooms, etc. During the past twenty years and more, the insect collection of the Entomological Branch has been added to steadily through collection of moths and other insects attracted to light at all times of the year, and so far not a single specimen of the army worm moth (*Laphygma exempta*) has been so collected. The moths have nevertheless been observed in some numbers at electric light after an outbreak, but the numbers so attracted have been very small compared with the numbers which must have been present in the vicinity at the time.

On the whole, therefore, there appears little prospect of utilising the attraction of light to control this pest.

The Editor,

The Rhodesia Agricultural Journal.

Sir,

Treatment of Galvanised Iron Tanks.

Many of us know of the water-proofing mixture of cement and a solution of common salt in water. I have, however,

only tried it for the first time this season, and the results have been so striking that I shall never put up a galvanised iron tank again without coating it inside and outside with this simple and inexpensive mixture.

I had occasion to move an old galvanised iron tank. When filled, it developed so many pin-holes and leaks that solder proved useless. Before scrapping it, I decided to try the salt and cement coating. The result was so successful that I now have the equivalent of a new tank.

Make a saturated solution of common salt; this can be done the day before use by putting some pounds of cattle salt in a petrol tin and filling with water. When ready to apply, take a double handful of Portland cement—I use the Rhodesian-made article—put in a dish and add the salt solution till the mixture is of the consistency of pea soup. Apply with a brush as one does white-wash. Do not make up too much at a time, and when made, use quickly. Two coatings at an interval of 24 hours or more are better than one.

Such treatment inside and outside will render the life of a galvanised tank almost indefinite.

I am, etc.,

J. M. MOUBRAY.

Chipoli, Shamva,
10th November, 1930.

Department of Agriculture.

WARNING.

The Government desire to draw the attention of all maize growers to the warning contained in the letter from the Secretary, Maize Inquiry Committee, published hereunder:—

Legislative Assembly Chamber,
Salisbury,
15th November, 1930.

The Secretary,
Department of Agriculture,
Salisbury.

Sir,

Warning to Farmers.

I am directed to inform you that the Maize Inquiry Committee has given long and earnest consideration to the immediate future prospects of the overseas maize trade. The evidence obtained indicates that for some considerable time low prices may prevail—so low, indeed, as probably to be unremunerative.

Consultation between my committee, the Rhodesia Agricultural Union and the Farmers' Co-operative Society, Ltd., resulted in complete unanimity on this point, and these associations agreed with my committee that the Government should be requested to caution the farmers and natives forthwith not to increase their acreage of maize this season.

Will you please convey this information to the Honourable the Minister of Agriculture and Lands?

I have the honour to be,
Sir,
Your obedient servant,
T. J. Needham,
Secretary, Maize Inquiry Committee.

It should be noted that the conclusion come to regarding the undesirability of increasing the acreage under maize this season has the weight of two organisations representing maize growers, in addition to that of the Maize Inquiry Committee.

Farming Calendar.

December.

BEE-KEEPING.

With a normal season the first or main honey-flow of the year should now be over and the honey ready to be robbed. Before doing this, see that all or the main portion of the frames are capped and sealed, otherwise there will be trouble later on by fermentation. There is nothing on the market to equal the Porter bee-escape board to clear out the bees from the crate, but be sure and see that the board in question is placed the right side up under the crate; failure to do this (and in the hurry of the minute it can easily be so done) will result in the probable suffocation of the bees and the loss of the honey, to say nothing of the chances of robbing from any close-by hives. Replace the empty combs and frames as soon as possible on the hives, to be cleaned up and mended where necessary, and for future storage of more honey. During the very hot spells watch the hives and provide extra ventilation, by inserting small metal wedges between the crates, just wide enough to allow air in, but not a bee under any consideration. Keep all water tins under the hive-stand legs full of water, and see that water is available for the worker bee. which drinks a good deal. When extracting honey, do so in a bee-tight room or verandah, otherwise the operator may have a lot of trouble from other colonies, which quickly find where honey is. Always have one or more crates of shallow frames ready with foundation fixed to place on hives as the season may warrant; such will mean always something for the bees to work at, and during the last flow they may be invaluable to store any such catch crop of nectar, as from tobacco, etc., when the natural flora is finished.

CITRUS FRUITS.

This is a good month to plant citrus trees into their permanent positions. They should on no account be planted deeper than they stood in the nursery. Water each tree immediately after planting it to settle the soil, then loosen the surface when sufficiently dry to check weed growth and restrict evaporation; continue loosening the surface soil after each rain or watering. If good rains have fallen, disc the grove in two directions, then sow the cover crop and harrow also in two directions. If the grove is weedy it should receive a shallow ploughing in place of the discing. Then sow the seed and harrow the soil. All bearing trees must be kept well watered if the weather continues to remain dry. Trees that suffer for want of moisture while the young fruit crop is developing will be adversely affected, and the crop—if any—will be of inferior quality. Continue to rub off all water shoots or suckers which develop on the tree stems.

CROPS.

Keep the cultivators going, both on planted and unplanted lands, whenever weather conditions are favourable. Destroy the weeds while young and before they obtain a firm root-hold.

Continue planting maize, cotton, beans and ground-nuts as early as possible this month, followed by sunflowers, Sudan grass, manna, pumpkins and cattle melons. Linseed, cowpeas, teff grass, oats, Sunn hemp

should be planted after the other crops are in. Ensilage crops may be sown at the end of the month. When harrowing maize after planting, this work should be done in the heat of the day when the young plants are flaccid and not easily broken. On lands not yet planted the crop of weeds should be kept down by disc-harrowing. It is a good plan to harrow or disc-harrow immediately before the planter, or alternatively to follow the planter with a light harrow. Treat seed oats for smut before sowing. Use one pint of formalin to 25 gallons of water and steep the bag of seed for ten minutes. Earth up early planted potatoes. Keep a look out for the stalk-borer, and top or otherwise treat affected plants. New lands and old pastures may be broken, as circumstances permit, during December, January and early February, and again ploughed in from May to July. If they carry a heavy crop of grass it should be cut or burnt to enable good, clean ploughing to be done. Sweet potato slips should be planted early in this month. Do not fail to have in a few acres of this valuable crop.

DAIRYING.

During the months of December and January veld grazing is usually plentiful, and very little extra feed in the form of concentrates is required for dairy stock. It should be borne in mind, however, that heavy milking cows are unable to satisfy their requirements for milk production from veld grazing alone, and should receive a daily allowance of grain; the latter should be fed at the rate of 2 lbs. for every gallon of milk produced daily, i.e., a cow producing three gallons of milk should receive 6 to 7 lbs. of concentrates. An excellent mixture for this purpose is one consisting of four parts maize meal and one part ground-nut cake.

During wet weather, the provision of a clean dry shelter for calves is essential; the latter should not be crowded together in a small, damp, badly ventilated pen or muddy kraal. When treated in this manner, a calf is very liable to contract various ailments such as scour, etc. Scour is entirely preventable, and is usually caused by over feeding, or feeding from dirty pails, feed boxes, etc. Calves which contract scour should be isolated, the milk ration reduced, and they should be dosed with a few tablespoonfuls of castor oil.

Under the weather conditions which now obtain, cream should be despatched to the creamery at least three times a week. It is of the greatest importance that cream should be cooled immediately after separation, and should be kept cool while on the farm and whilst in transit to the railway station or siding. While the cream is being cooled, it should be frequently stirred, using a stirrer with a plunger attachment. Warm, freshly separated cream should not be mixed with old cream which has already been cooled. Cool the fresh cream first and then mix thoroughly with the old cream. Gassiness is a common defect in the cream received at the creameries at this time of the year, and is caused by gas-producing organisms with which the milk and cream are contaminated. These organisms abound in mud, manure, etc., and develop and multiply very rapidly at high temperatures. Any precautions therefore which may be taken to eliminate dirt, manure, etc., from the milk and to keep the cream cool will prevent the development of gassiness.

As the night temperatures are fairly high, cheese-makers should not attempt to use night's milk for cheese-making; morning's milk plus a starter will give the best results. Gouda cheese-making operations are not usually successful at this season of the year, owing to the poor quality of the milk and the prevalence of gassiness. This type of cheese is best manufactured during March and subsequent months.

DECIDUOUS FRUITS.

Cover crops may be planted when the rains commence, as recommended under citrus fruits. Summer pruning may be commenced this month. If all undesirable shoots are taken out of the trees, the remaining shoots will

receive sufficient air and light to mature. Ripening fruit must be carefully harvested, graded and packed if satisfactory prices are to be secured. Do not gather any fruit when it is wet. Keep all recently planted trees in good condition; the first year's growth is the most important. If the undesired shoots are rubbed off when they first appear, the retained shoots will receive all the nourishment and the tree will then grow to a large size.

ENTOMOLOGICAL.

Maize.—The first half of this month appears to be the best period during which to plant maize for the avoidance of stalk borer attack—at least in the Salisbury district. Hoe out and remove volunteer maize plants before the new crop is up, as they are liable to be infested with borer, which tends to spread to surrounding plants. Red soils may be baited with chopped Napier fodder or other suitable greenstuff dipped in arsenite of soda 1 lb., cheapest sugar 8 lbs. or molasses 1 gallon, water 10 gallons, to destroy surface beetles, snout beetles and other insects which may affect the primary stand.

Tobacco.—The enemies of this crop are in general most active during December, whilst the crop is still in the early stages of growth.

For information regarding tobacco pests, see "Rhodesia Agricultural Journal," January, 1928, or Bulletin No. 665.

In general, poisoned baits may be used against surface beetles, grasshoppers, crickets and cutworms. Against surface beetles, arsenite of soda 1 lb. in 30 gallons of water used to moisten maize bran is a good bait. Against grasshoppers and crickets the addition of 8 lbs. sugar or 1 gallon molasses to each 1 lb. of arsenite of soda is recommended. Spray with arsenate of lead (powder) 1 lb. in 30 gallons of water against leaf-eating insects and as a protection against leaf miners and stem borer. Transplants may be dipped head downwards as far as the roots in the poison. Discard seedlings infested with stem borer and root gallworm.

Cutworms.—Keep ground around seed beds as free as possible from vegetation, to prevent female moths from laying eggs there. From the time the plants show foliage of the size of a sixpence they should be sprayed weekly with arsenate of lead (powder) 1 lb. to 30 gallons of water. This should prevent cutworms developing in the beds, as the young cutworms attack the leaves of the seedlings, and so ingest the poison.

House Flies.—With the coming of hot weather and the rains, house flies greatly increase, and should be kept out of dwelling houses by mosquito netting, or poisoned in the following way:—Dissolve 1 lb. of sodium arsenite in 10 gallons of water, and add about 10 lbs. of cheap sugar (2 gallons of treacle) or other sweet substance. The mixture should be sprayed upon branches of shrubs or trees, which may be hung up in convenient places where flies congregate. These insects are attracted to the bait, and are easily poisoned.

Mosquitoes, Stable Flies.—Destroy breeding places around homestead. Poison or trap adults.

Potatoes.—Ladybirds and caterpillars may be injurious to the foliage, and on sandy soils blue blister beetles sometimes cause damage. Spray with arsenate of lead (powder) 1 lb. to 25 gallons of water.

Kitchen Garden.—Marrows, etc., are commonly attacked by leaf-eating beetles. Spray with arsenate of lead (powder) 1 lb. in 25 gallons water, plus 8 lbs. cheapest sugar or 1 gallon molasses. Dusting lightly with pure arsenate of lead powder should give protection. Young plants of the cabbage family may be dusted with pure arsenate of lead powder or with such powder mixed with up to six or eight parts of finely sifted, thoroughly slaked lime as a protection against leaf-eating insects.

Fruit Trees.—The regular collection and destruction of fruit beetles may be necessary. Choice varieties of peaches, etc., may be netted as a protection against pests.

FLOWER GARDEN.

This month is generally showery, and constant stirring of the soil is, therefore, necessary to keep it loose. Seeds of perennials and annuals for February blooms may be sown. Transplanting should be done in the evening or on a cloudy day. Carnations should be kept free from dead wood, and climbers attended to.

VEGETABLE GARDEN.

All vegetable seeds may be planted. All advanced plants should be constantly cultivated. Potatoes should be ridged, and peas, beans and tomatoes staked. This is a good month for planting the main crop of potatoes.

FORESTRY.

Final preparations for planting should be made, including harrowing or pitting. Early plantings may be carried out if the season is a good one. Planting should be carried out on dull, rainy days, or failing such days, late in the afternoons. Great care should be exercised in planting out to avoid bending the tap root, and to set the trees in the ground at the same level as they were in the seed bed or tray. Late sowings of Cedrela toona seed may be made.

POULTRY.

The poultry keeper should take precautions whereby the wet weather will not affect his birds' health and their laying powers. All houses must be absolutely watertight, the floor raised well above the level of the surrounding ground, thus preventing water seeping in and making it damp. The birds themselves should not get wet, and no pools of water should be seen in the runs. Foodstuffs also must be kept absolutely dry.

Many birds will at present be moulting; these require special treatment to bring them through it quickly, and if possible keep them in lay during the period. A pamphlet on this can be obtained from the Poultry Expert, Department of Agriculture. This lack of attention to the birds during the moult is one of the causes of the scarcity of eggs at this season. There is no need for it if poultry keepers would only look after their birds properly.

Those who intend disposing of their turkeys for killing at Christmas must avoid cooping them up, as is done when fattening fowls, for they immediately mope and go off their food. Give them free range, and in addition to their usual evening feed of maize, during the first week of December give one of wheat or maize in the morning, and during the second and third weeks three meals a day, each one containing, in addition to wheat or maize, some crushed monkey nuts or sunflower seeds. Plenty of thick milk and chopped-up onions or onion tops should also be given.

Those who go in for ducks should feed well and get as many to marketable size as possible by Christmas, when they usually fetch good prices. They should be kept in a small run; nearly all their food should be wet mash, bran, pollard, maize meal, meat meal and milk, as much as they will eat three times a day, i.e., they should practically be allowed to spend their existence eating and sleeping. Big duck breeders often give a fourth meal by lamplight at 10 p.m., and the first meal is given at sunrise.

STOCK.

Cattle.—Ranching cattle should not require any attention beyond dipping, but any stock that are in weak condition will be the better for a little hay or a pound or two of maize at night until they have regained strength. The bulls should be returned to the herd either at the end of the month or in January, and it should be remembered that the better they are conditioned and fitted for their work the more hope there is of a good crop of calves. For this reason also every effort should be made to have all the female stock in strong condition. Dairymen will find

that as the grass becomes lush and rank a supply of sweet veld hay, teff hay or, say, three pounds of crushed maize given in the sheds at night will enhance both the quality and quantity of the milk. This will be found to be the case more particularly in districts of heavy rainfall. Milch cows should be protected as much as possible from cold rains and hot sun. Yarding all night in a clean kraal provided with a simple lean-to shed well bedded up will be found to be very beneficial in seasons of protracted rainfall. The calf pen should be kept clean, dry and sweet, and young calves will be better kept in during very hot or very wet weather. Dipping should be regularly attended to.

Sheep.—Graze on the higher lands, keeping the kraals clean, dry and airy, and watch for ticks.

TOBACCO.

Continue preparation of land. The best results are obtained by transplanting on well prepared soil. Transplanting should be pushed on with as fast as transplants and climatic conditions will allow. As soon as plants begin to grow, go over the field and fill in all missing hills with strong selected plants, and then apply fertiliser to hasten growth and ensure early maturity. Cultivation should be commenced as soon as the plants start growing, especially on sandy soils. The crust caused by heavy rains should be pulverised through cultivation as soon as the surface soil is dry enough for tillage; this gives the young plants the benefit of the moisture stored in the soil. Do not neglect the late sown seed beds. Make every effort to finish transplanting before the end of the month, so that the crop will be harvested before dry, cool weather begins.

VETERINARY.

Occasional cases of horse-sickness may occur during this month. With the great increase in ticks, due to the heat and moisture, cases of redwater and gall-sickness may be expected, more especially amongst Colonial stock imported since the last rainy season. The cool weather which frequently follows the early rains is an excellent time for castrating calves and other animals.

WEATHER.

In Mashonaland the rainfall during this month varies from eight inches along the eastern border to six inches in the west. In Matabeleland it varies from five-and-a-half inches in the west to four-and-a-half inches in the south. Considerable divergencies from these normals may occur in individual seasons, but on the whole this month is the most regular in its behaviour. Very heavy downpours may be looked for, and it is well to be provided by drains and ditches against the effects of very heavy rain storms. A dry spell about Christmas time is a very frequent, though not invariable, event in Rhodesia. This partial drought may last only a fortnight, or may extend to six weeks, in the latter event often causing some anxiety regarding young crops, especially those not yet through the ground. The best means of meeting this condition of the weather is by frequent surface cultivation by harrow or horse hoe to preserve a loose soil mulch on the surface and prevent losses of soil moisture by evaporation.

January.

BEE-KEEPING.

This month is a slack one for actual hive work. Each hive should continue to be carefully watched to see that any attempt by the wax moth to gain a footing is at once stopped. In the great heat of this month, see that proper ventilation is supplied, as well as enough water. Precautions against the depredations of white and other ants should also be watched

daily. Where possible, examine now and again the brood chamber for queen cells, and destroy them if not wanted. Requeening can be done where desired on the uniting system, if the apiarist does not know of the better plan of rearing his own queens. In the workshop have a spare hive or two complete and ready for occupation, well painted, for any new swarms that may be required in the coming months. Though the second honey flow of the season is not due to start until about March or April, there should be ample stores coming in meanwhile to keep all bees busy in breeding, nursing, and bringing the hive generally to full strength for the winter, as well as for their own daily food supplies. There will not be enough honey coming in now for surplus purposes, therefore see that the supers are not left on the hives to a greater degree than to give the inmates plenty of room to loaf in.

CITRUS FRUITS.

The planting of citrus trees should be completed if possible by the end of the month, for trees planted later may not harden up before the winter: they then become susceptible to winter injury from cold. This month is the best one for planting shelter belts to protect all varieties of fruit trees from the prevailing dry winds. Cover or green crops may be planted during this month; if the grove has been over-run with grass or weeds, sow the cover crop seed more thickly. This will assist in smothering future weed growth. Continue suppressing any undesirable shoots that may develop on the tree trunk or other parts of the tree. Drain any depressions that allow rain or irrigation water to accumulate at the base of the trees, for trees permitted to stand in water will speedily fall victims to disease or pest injury.

DECIDUOUS FRUITS.

Continue planting cover or green crops between the trees. These crops may then be turned under towards the end of the rainy season to furnish the necessary humus.

Summer pruning may be continued. Rub or break off any undesirable shoots that have a tendency to crowd each other; suppress all growths on the main stem from the ground level up to the main arms of the tree, for these are unnecessary. If next year's fruit crop is to be of good size and quality, the inner fruiting wood of a tree must receive sufficient air and light to mature fully. If the new growth is too dense it will prevent the fruiting wood from maturing, and poor crops will be the result. The thinning out of the summer growth will overcome this crowding and weakening of the fruiting wood.

Many fruits will be ripening during the month. Do not permit the fruit to become over-ripe on the trees; rather harvest it at the correct stage and store or sell the surplus.

Plant shelter trees if the orchard is exposed to the prevailing winds, as good crops of fruit cannot be expected from inadequately protected fruit trees.

CROPS.

If not already sown, put in the ensilage and fodder crops at once, such as maize and legumes, oats and other hay grass crops. Sow short season crops like haricot beans, linseed, buckwheat, peas, summer oats, gram and mung bean. Plant out grasses and kudzu vine for pasture. Ridge potatoes and cultivate thoroughly. Main crop can still be planted. Quick growing green manuring crops, such as cowpeas, soya beans and sunn hemp, may still be sown this month. Earth up ground nuts so that a small amount of loose soil is thrown over the crowns of the plants. This assists the formation of nuts. If not already done and where practised, legumes or long season oats such as Algerian can be sown under the maize crop for grazing and to add nitrogen and humus to the soil. Cultivate all growing crops well, and thoroughly eradicate weeds. Overhaul all hay-making implements and ploughs and get in thorough repair in

preparation for the haying and ploughing seasons. Endeavour to mow grass fields early for hay and litter, and to obtain second cutting for hay in April. Fallowed lands or fields not yet planted may be disc-harrowed or ploughed to prevent weeds from seeding. Mow grass paddocks infested with annual weeds to prevent the weeds seeding. Prevent Mexican marigold and other noxious weeds seeding by hoeing or pulling out the plants by hand. Keep a sharp look-out for maize stalk borer. Cut off the tops of infested plants or treat them with a recognised chemical preparation. If topping is practised, remove tops from land, and bury, burn or feed them at once to farm stock. Watch the maize lands for witch weed. Prevent witch weed plants from seeding by cultivation and by hand-pulling the plants. Make as much manure as possible by placing grass and litter in cattle kraals, pig sties and stables. If there is stumping and clearing to be done, push on with it. Endeavour to get as much of the new virgin land as possible broken up during this and the two following months.

DAIRYING.

(See December.)

ENTOMOLOGICAL.

Maize.—Late planted maize, particularly crops planted after the New Year, are frequently attacked by the maize stalk borer (*B. fusca*, Full.) in districts where this pest is prevalent. The yield of grain from heavily attacked stands is usually very low, and such crops are most economically used as ensilage. Plants attacked are easily detected in the fields, as the newly hatched caterpillars eat the young leaves before entering the stalk. Top dressing with a suitable insecticide should be employed to ensure a good yield. There are several insecticides which can be used for top dressing which kill the young caterpillars without causing severe injury to the plant. Kerol, Kymac or Hycol used at a dilution of 1 in 300, or Pulvex, 1 in 54 gallons of water, give satisfactory results. A new preparation, Derrisol, is highly recommended by the manufacturers at 1 in 1,000, and is stated to be quite innocuous to the plants. The liquid should be poured into the funnel-shaped cup formed by the young leaves. Only those plants showing attack are usually treated. With a light infestation, one native can treat about five acres per day. Several treatments may be necessary. Young maize plants up to six weeks old can be treated by cutting the plant below the point attacked. The portions cut off must be removed from the lands.

Various leaf-eating insects (including the snout beetle (*Tanymicus destructor*), the surface beetles, grasshoppers, etc.) attack young late planted maize.

The attack by the snout beetle may be very severe. If there is time, it is often advisable to harrow in the old crop, treat the land with poison bait and re-plant, or poison bait may be used without removing the crop. The best carrier for poison bait is chopped Napier fodder or some other green succulent grass, including maize itself; failing this, maize or wheat bran may be used. The carrier is thoroughly covered or impregnated with a solution of arsenite of soda 1 lb., molasses $1\frac{1}{2}$ gallons, or cheapest sugar 8 lbs., water 10 gallons, and broadcast. The cheapest arsenite of soda to employ is locust poison, diluted 1 in 200, and equivalent quantity of sweetening agent added. The best results are obtained if the broadcasting is done in the evening, as the hot sun dries up the bait too quickly and renders it unattractive to the beetles.

Army Worm (*Laphygma exempta*) may put in an appearance during the latter half of December, and a sharp look-out should be kept for the caterpillars, especially on sweet grasses near the maize lands and on "rapoko grass" (*Eleusine indica*) on the lands. (See *Rhodesia Agricultural Journal*, October, 1930, page 1055.)

Black Maize Beetle.—Both larvæ and adults of this beetle are active during this month. Hand collecting of the adults is the only practical

procedure. For further control measures, see *Rhodesia Agricultural Journal*, February and April, 1925.

Potatoes.—This crop, if attacked by leaf-eating ladybirds, blister beetles or other leaf-eating insects, may be sprayed with arsenate of lead (powder), at the rate of 1 lb. in 25 gallons of water. This poison may be combined with Bordeaux Mixture when spraying against early blight. To protect potatoes from potato tuber moth, the rows should be ridged deeply and the tubers kept covered with soil.

Tobacco.—Tobacco in the field is attacked by many insects during this month, and growers should keep a copy of Bulletin No. 665, "Tobacco Pests of Rhodesia," handy for reference, or refer to *Rhodesia Agricultural Journal* for January, 1928. The following very brief account of the more common insect pests attacking this crop may help the grower who cannot consult the above-mentioned bulletin.

Cutworms.—Keep all lands free from weeds up to the time of planting out.

Stem Borer.—All seedlings showing the characteristic swelling should be destroyed by fire. Plants in the field should be destroyed and replaced, or the plant may be cut off below the swelling and one sucker encouraged to grow. The latter procedure needs to be carried out early.

Leaf Miner.—All primings should be destroyed, and infected leaves may be picked off.

Seed Beds.—Seed beds which are no longer required should be cleaned up and not allowed to become a breeding ground to infest the fields. Beds in use should be kept properly covered with limbo and sprayed weekly with arsenate of lead, 1 lb. in 30 gallons of water.

Wire Worms (*Trachynotus* spp.).—Several species of wire worms attack this crop during January, particularly on sandy soils. It is now too late to attempt control. Control depends upon the accurate timing of the emergence of the adult beetle and poisoning with a poison bait. Emergence usually takes place late in April or in early May. The bait consists of maize meal or bran poisoned with arsenite of soda (locust poison, 1-200). The bait is made up into balls, scattered about the lands. The balls should be covered with leaves, to give attractive shade and to assist in keeping the bait moist. Moisture should be added when necessary.

Surface Beetles (*Zophoses* spp., *Gonocephalum* sp.).—The same control measures apply as for wire worm. Baits recommended against wire worm can be applied during January. No sweetening matter is necessary.

Bud Worm (*Heliothis obsoleta*).—Destroy all caterpillars by hand during "topping." Examine all bagged seed heads weekly and destroy any caterpillars discovered.

Other Leaf-Eating Caterpillars.—A bad attack in the field may be controlled by spraying with arsenate of lead (powder), 1 lb. to 30 gallons of water. A knapsack spray pump with a cyclone nozzle is necessary. Hand picking may be employed.

Beans, Cowpeas, etc.—Haricot beans and cowpeas are liable to attack by the stem maggot (*Agromyza* sp.). This small fly deposits its eggs in the young leaves, often within a few days of germination. The larvæ mine along the veins and down the stem, pupating about soil level. Practically nothing can be done to protect a field crop. Velvet beans, Jack beans and dolichos beans are not attacked by this pest.

All varieties of beans are attacked by a leaf-eating beetle (*Ootheca mutablis*). This small insect can be controlled by spraying with arsenate of lead (powder), 1 oz. to 3 gallons of water.

Blister beetles are often very numerous on the flowers of all species of beans and cowpeas. Hand collecting has been found to be the most economical measure.

The bean stem weevil is a minor pest of beans in the kitchen garden. All plants attacked by this weevil should be picked out and burnt.

Sweet Potatoes.—Sweet potatoes may be attacked by caterpillars of the sweet potato sphinx moth. These should be collected by hand.

Kitchen Garden.—Marrow and cucumber plants about to set fruit may be sprinkled regularly with the following formula to destroy fruit flies which "sting" fruit :—Arsenate of lead (powder), 1½ ozs.; molasses, ½ gallon, or cheapest sugar, 2½ lbs.; water, 4 gallons. To destroy leaf-eating insects generally, dust plants with arsenate of lead (powder), 1 part in 20 parts of finely-ground maize meal or finely-sifted slaked lime. *Aphides* (plant lice) may be treated with soap, 1 lb. in 5 gallons of water, or tobacco wash, or simply by regular spraying with a forceful stream of cold water from a spray pump.

Fruit Trees.—Deciduous fruits are subject to attack by large beetles, which should be destroyed by jarring into a net and dropping thence into a tin containing water, with a film of paraffin on the surface. Trees should be covered in mosquito netting to protect the fruit from fruit-piercing moths. The large adult beetles of the fig borer may be seen on the young shoots and should be destroyed. Borers in the trunks of the trees may be killed by injecting a little carbon bisulphide.

Mosquito, House Flies, etc.—Screen windows and doors. Destroy breeding places around homestead. House flies may be poisoned cheaply with sweetened arsenite of soda solution. Write for directions.

When in doubt as to the identity of any pest or the method of dealing with it, apply promptly to the Chief Entomologist, Salisbury, bringing or sending specimens of the insects concerned. Note, however, that it is sometimes feasible to prevent injury from pests for which no practical remedy is known. Farmers should therefore endeavour to obtain some knowledge of the pests of the crops they are growing through the articles published in this Journal.

FLOWER GARDEN.

This month requires all one's energy in the flower garden. Annuals may still be sown for late flowering before the season is over. Planting out should be done as early as the weather permits, and advantage taken of a dull day after a shower for this work. If care be exercised much smaller plants may be put out than would at first be thought advisable, as with attention these will make stronger plants than larger ones, which are more likely to receive a check. The soil requires constant stirring, owing to the packing caused by the rains and for the eradication of weeds, which are now very troublesome. All plants should be kept free of dead and decaying matter.

VEGETABLE GARDEN.

Turnips, carrots, cabbages, lettuce, etc., may be sown for carrying on during the winter months. Potatoes may be planted this month for keeping through the winter. Weeding and cultivating between the rows should be continually carried on.

FORESTRY.

If the rains are seasonable, plant out evergreen trees, such as gums, cypress, pines, etc. Fill in all blanks as soon as they are noticed, and do not leave them until the following season. Planting should be done on a wet day, or, failing that, on a dull day, or late in the afternoon. Great care should be taken to see that the trees are not planted out any deeper than they stood in the tins.

POULTRY.

All houses must be absolutely watertight, the floor raised well above the level of the surrounding ground, thus preventing water seeping in and making it damp. The birds themselves should not get wet, and no pools of water should be seen in the runs.

Foodstuffs must be kept absolutely dry, otherwise they will become mouldy and sour, causing disturbance of the intestinal tract, illness, and perhaps death; certainly a diminution in the number of eggs.

Some of the birds will now be in moult. To get them through it quickly give more sunflower seed, some monkey nuts, plenty of green food, especially cabbage, kale, etc., plenty of milk or some meat, a little sulphur in the dry mash (one teaspoonful to 1 lb.); also stew two dessert spoonfuls of linseed in a pint of water to a jelly, mix this to a crumbly consistency with mealie meal or bran, and give about one dessert spoonful to each bird daily. Keep the birds dry during the rains, otherwise the egg output will decrease.

Do not hatch any more turkeys till after the rainy season is over. Turkeys should not be penned up, but allowed on free range.

Ducks must be treated in almost exactly the reverse manner to what turkeys are. They should be kept in a small run; nearly all their food should be wet mash, bran, pollard, mealie meal, meat meal and milk, as much as they will eat three times a day, *i.e.*, they should practically be allowed to spend their existence eating and sleeping. Big duck breeders often give a fourth meal by lamplight at 10 p.m., and the first meal is given at sunrise.

STOCK.

Cattle.—The recommendations for December apply equally to this month. Bulls should be returned to the herd during the month if a September or October calving season is desired.

Sheep.—Continue as recommended for December. If heavy rains are experienced a daily ration of a quarter of a pound of maize per ewe will keep them in condition, and will often prevent much trouble arising from poverty and anæmia. Those who favour autumn lambs must put the ram again with the flock in February, and should therefore now take steps (if necessary) by supplying a little extra feed as above recommended to fit the ewes for mating. A little forethought of this kind will tend to increase the stamina of the lambs and to bring the ewes in season more or less together, so that a protracted lambing season is avoided.

TOBACCO.

Cultivation should be systematically continued, and no foreign vegetation allowed in the tobacco field, as weeds and grass induce insect attacks. All backward plants should be given special attention, and an additional application of fertiliser to hasten growth, so that the plants ripen as uniformly as possible. Curing barns should be placed in proper condition on rainy days, and all tobacco appliances should be placed in proper order for the rush of work during the curing season. Early planted tobacco may be ready for topping during the latter part of the month, and the common mistake of topping too high should be avoided. Go over the field carefully and select typical, uniform and disease-free plants for producing seed for next season's crop. All plants should be properly primed at the same time that the tobacco is topped.

VETERINARY.

Horse sickness may now be expected, especially in districts where early heavy rains have occurred. Blue tongue in sheep will also be prevalent.

WEATHER.

Heavy rain is to be looked for, and during this month we may normally expect nine to twelve inches on the eastern border, eight in the north, and seven to seven and a half as one travels westwards or southwards. At this time of the year the rainfall tends to be heavier in the eastern than in the western portions of the Colony, whilst prolonged steady rains take the place of the thunder showers which marked the earlier part of the wet season. The growing period is at its height, and high temperatures are registered.

Southern Rhodesia Veterinary Report.

September, 1930.

AFRICAN COAST FEVER.

The infected herds from the farms Schaapplaats, Wolfscrag and Canterbury, Melsetter district, were all slaughtered by the end of the month.

ANTHRAX.

An outbreak occurred in the Hartley district and a recrudescence in the Bushu Reserve, Mazoe district, and on the Salisbury commonage. All animals grazing on these areas are being inoculated. The mortality was three head.

JOHNE'S DISEASE.

One case was diagnosed in Salisbury.

TRYPANOSOMIASIS.

Four cases Hartley, 1 case Lomagundi, 1 case Melsetter and a few in Wankie district.

HEARTWATER.

One beast died on Salisbury commonage, attributed to heartwater, as a bont tick was found on the animal.

QUARTER EVIL.

Very few cases reported.

SCAB.

One flock in Melsetter district placed in quarantine.

SHEEP.

In some districts there have been heavy losses due to verminasis.

IMPORTATIONS.

From the Union of South Africa: Bulls 37, cows 35, calf 1, horses 36, donkeys 361, sheep 2,112, goats 206. From Bechuanaland: Sheep 666.

EXPORTATIONS (CATTLE).

To Union of South Africa: For local consumption, 1,031; for overseas, 2,871. To Belgian Congo: Slaughter 2,440, breeding 60. To Northern Rhodesia: Slaughter 460, breeding 30.

EXPORTATIONS IN COLD STORAGE.

August and September.—Carcases: Beef 808½, calves 88, sheep 115, pigs 85, quarters beef 31, livers 580, tongues 469, hearts 425, brains 201, tails 522, tripes 403, heads 38, plucks 21, feet 50.

EXPORTATIONS (MISCELLANEOUS).

To Union of South Africa: Horses 2, sheep 24, goats 30. To Northern Rhodesia: Horse 1, sheep 322, goats 56, pigs 80. To Belgian Congo: Pigs 145. To Portuguese East Africa: Sheep 42, goats 5.

J. M. SINCLAIR,

Chief Veterinary Surgeon.

Southern Rhodesia Weather Bureau.

OCTOBER, 1930.

It has been decided to discontinue the long schedule of rainfall records on the score of expense. In its stead we shall publish monthly a schedule of climatological data from approximately thirty stations.

Rainfall observers are requested to make their monthly returns as usual, as these, although not published in the Journal, will be necessary for the calculation of the mean rainfall over the zones, and will appear in detail as usual in the annual report.

Pressure.—The barometric pressure during the month was generally high, varying from 0.011 in. above normal at Bulawayo to 0.046 in. above normal at Victoria.

The movements of highs and lows during the month were unusual. The winter anti-cyclone on the east coast was maintained, with very slight breaks, throughout the month. During the period 11th to 14th, shallow V depressions extended into Rhodesia from the north, and were accompanied by unsettled weather, particularly in the north and east.

Rainfall.—The rainfall for the month was 0.08 in., or about 8 per cent. of the average; in 1905, 0.07 in. was recorded, and in 1914, 0.04 in.

The distribution was very unequal.

Zone.	Oct., 1930.	Normal, Oct.
A	0.00	0.80
B	0.01	0.90
C	0.05	1.08
D	0.19	0.94
E	0.09	1.20
F	1.23	1.91

Station.	Altitude	Pressure 8 a.m.	Temperature ° F.						Humidity, 8 a.m.		Precipitation.		
			Absolute.		Mean.			Diff. from Normal.	Wet Bulb.	%	Ins.	Diff. from Normal.	No. of Days.
	Feet.	Mb.	Max.	Min.	Max.	Min.	½ M x. Min.						
Bulawayo ...	4,440	862.5	97	49	86.8	57.5	72.1	−0.3	56.2	37	Nil	−0.9	...
Gwelo ...	4,632	864.2	96	47	85 2	55.2	70.4	−0.4	55.9	42	Nil	−0.8	...
Riverbank ...	(3,700)	...	106	49	94.1	59.5	76.8	+1.5	58 1	30	Nil	−0.7	...
Brunapeg ...	(3,000)	...	102	52	89.1	62.0	75.5	...	59.7	46	Nil	−0.7	...
Essexvale ...	3,828	...	104	51	89.8	57.3	73.5	−0.4	58.4	43	Nil	−0.8	...
Gwanda ...	3,235	908.2	102	50	86.6	59.7	73.1	...	57.9	42	Nil	−0.9	...
Holly's Hope ...	3,420	...	104	50	89.7	59.8	74.7	−0.5	59.3	40	Nil	−0.7	...
Nuanetsi ...	1,630	...	103	48	90.6	58.6	74.6	...	62.5	52	Nil	−0.7	...
Between Rivers	3,970	...	101	47	92.9	55.5	74.2	...	...	...	0.06	...	2
Enkeldoorn ...	4,720	...	95	47	83.8	54.3	69.0	−1.9	56.5	36	0.02	−1.3	1
Gatooma ...	3,850	...	100	49	91.7	56.2	73.9	−3.3	...	...	0.02	−1.1	1
Miami	4,090	...	...	...	...	...	...	...	...	...	...	...	...
Salisbury ...	4,865	856 6	91	49	84.2	56.7	70.4	−0.3	54.9	36	0.02	−1.2	2
Sinoia	3,830	..	...	...	...	...	...	...	...	...	...	...	...
Sipolilo... ...	3,900	...	...	...	...	...	...	...	...	...	...	...	...
Juliasdale ...	6,070	...	85	43	75.9	49.1	62.5	+0.8	55.4	50	0.50	−0.9	1
Mtoko	4,210	...	...	...	...	...	...	...	...	...	...	...	...
Shamva ...	3,170	...	...	...	...	...	...	...	...	...	...	...	...
Virginia Estate	3,730	...	100	48	92.3	54.4	73 8	...	58.1	44	Nil	−0.6	...
Angus Ranch ...	(2,300)	...	101	56	87 9	62.3	75.1	...	62.5	48	0.10	−0.7	3
Craigendoran ...	(3,000)	...	102	52	89.2	57.0	73.1	...	...	...	0.06	−1.6	2
Mount Arthur...	(5,000)	...	...	...	...	...	...	...	...	...	0.13	...	2
New Year's Gift	2,700	...	98	52	86.1	57.8	71.9	...	60.3	48	0.26	...	2
Nyamasanga ...	5,080	...	91	45	81.3	51.2	66.2	...	54.6	36	0.06	...	1
Riverdene North	3,700	...	100	43	87.7	51 0	69.3	−3.2	...	...	Nil	−1.1	...
Stapleford ...	5,450	...	84	43	71.0	50.4	60.7	..	53.2	57	0.98	−1.1	4
Umtali	3,677	895.0	94	49	81.5	56.0	68.7	−3.2	57.8	55	0.29	−1.2	3
Victoria ...	3,570	897.4	98	47	84.7	54.3	69.5	−1.5	59.3	39	Nil	−1.1	...
Melsetter ...	5,060	...	88	45	75.7	53.0	64.3	−2.6	55.0	39	2.74	+1.4	3
Mount Selinda...	3,520	...	90	47	76.1	53.9	65.0	−3.7	57.8	54	2.21	+0.3	3

Export of Cattle from Southern Rhodesia, 1930.

Month	Union		England.	Congo		N. Rhodesia.		Portuguese East Africa.		Total
	Slaughter		Slaughter							
	Union of S.A.	I.C.S. for overseas	On hoof	Slaughter	Breeding	Slaughter	Breeding	Slaughter	Breeding	
January ...	...	...	...	2,449	67	...	...	...	...	2,516
February ...	...	...	..	3,438	8	537	91	...	11	4,085
March ...	25	...	160	1,097	...	249	...	...	7	1,538
April ...	53	863	...	2,636	115	120	16	...	...	3,803
May ...	783	1,628	160	1,517	593	268	176	...	...	5,125
June ...	1,132	2,660	...	1,810	11	407	...	...	...	6,020
July ...	1,273	5,505	...	1,525	2,257	299	128*	...	...	10,987
August ...	1,661	5,939	...	2,673	...	332	...	...	7	10,612
September ...	1,031	2,871	...	2,440	60	460	30	...	...	6,892
October ...	831	1,919	...	1,607	32	122	11	...	...	4,522
November ...										
December ...										
	...	...	...	...	...	...	...	...	...	...

* Trek oxen.

Dairying in Southern Rhodesia.

Official Milk Records.

Name of cow.	Breed.	Date of Birth.	Milk in lbs. to date.	Butter fat in lbs. to date.	No. of days.	Name and address of owner.
Morgenzon Symphony	Friesland	24.9.23	7,582.90	285.78	300	W. R. Blackwell, Norton
Morgenzon Kleingoed	do	13.1.24	6,845.40	249.89	300	do do
Maldon Dot	Shorthorn	18.6.25	2,863.00	109.82	300	Roberts & Letts, Heany Junction
Whinburn Zephyr	Friesland	8.7.27	5,112.20	169.93	300	R. R. Sharp, Redbank
Whinburn Pansy	do	22.12.24	6,240.70	203.90	300	do do
De Grendel Boukje	do	12.6.25	8,085.50	306 80	300	A. F. Valentine, Umtali
Groenvlei Bedford Alberta	do	15.9.18	9,858.95	312.99	300	P. T. Webb, Iron Mine Hill
Brightwell Rain	Red Poll	25.4.26	8,545.30	284.65	360	Govt. Farm, Matopos
Drinkstone Missie	do	31.12.26	6,630.90	252.54	300	do do
Threave Flowergirl	Ayrshire	7.4.27	7,999.50	365.53	330	do do

Semi-official Milk Records.

Name of cow.	Breed.	Milk in lbs. to date.	Butter fat in lbs. to date.	No. of days.	Name and address of owner.
Redbank No. 165	Grade Shorthorn	7,573.50	283.32	300	Roberts & Letts, Heany Junction
Wren ...	Grade Friesland	6,323.80	202.57	300	R. R. Sharp, Redbank
Grace ...	do	5,608.50	224.55	300	M. S. Smith, Gwelo
Ugly	do	4,629.50	241.03	300	do do
Wendy ...	do	5,769.50	259.77	300	do do
Surprise ...	do	5,700.10	226.86	300	P. T. Webb, Iron Mine Hill
Gwebi Sunshine	do	6,590.50	244.86	330	Govt. Farm, Gwebi
Gwebi Algie ...	do	4,697.00	173.91	300	do do
Gwebi Mabel ...	do	6,814.50	226.75	300	do do
Bochensheila No. 127 ...	Grade Shorthorn	6,336.00	220.54	300	Roberts & Letts, Heany Junction

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